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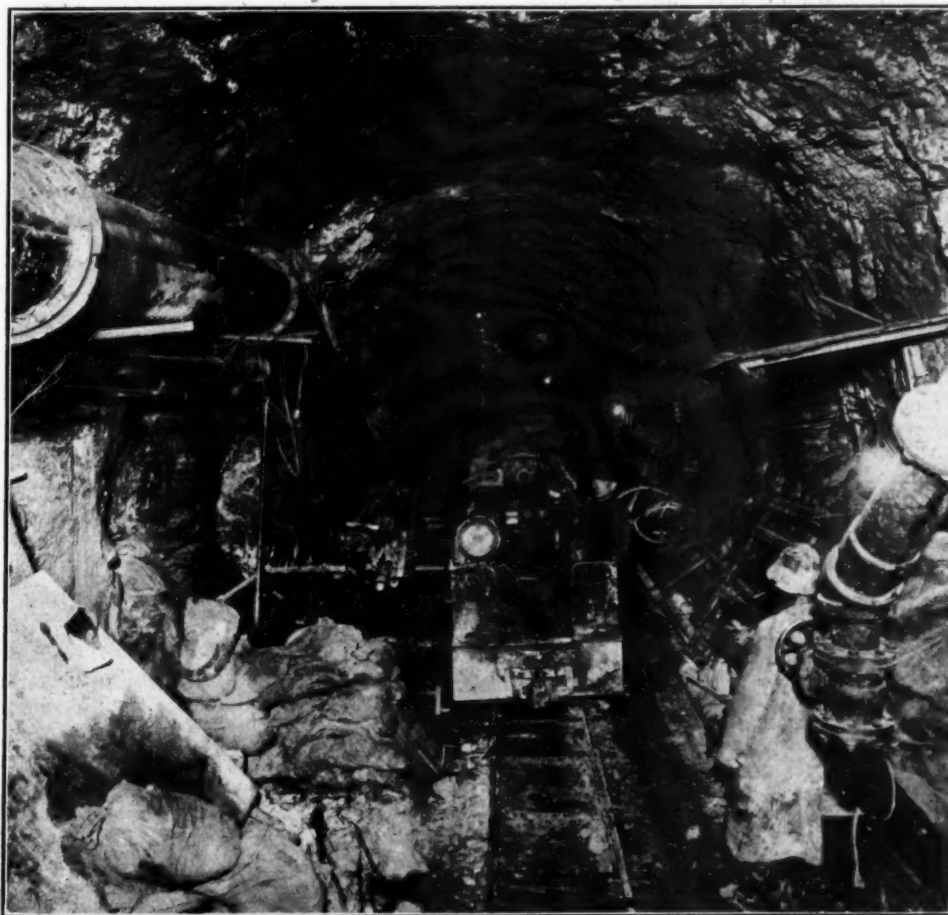
## CONSTRUCTION OF WILSON AVENUE INTAKE TUNNEL

Chicago Performing Three Million Dollars' Worth of Work by Day Labor at Considerable Saving in Time and Cost Over Contract Work—Two-Shift and Three-Shift Working—Several Novel Methods Employed.

By F. H. BERNHARD.

The water supply of Chicago is obtained from Lake Michigan through tunnels connecting intake cribs  $2\frac{1}{2}$  to 4 miles from shore with a series of pumping stations, of which four are near the shore and five are inland as much as  $5\frac{1}{2}$  miles from shore. A new water tunnel is being built at Wilson avenue, in the construction of which many original methods have been developed. Over 95 per cent of this tunnel is being built by the city on the day labor plan and the work is being carried on

tially met by the complete rebuilding of the Lake View pumping station a few years ago; but to supply the district some distance in from the lake as well as suburbs northwest of the city, which are entitled to city water, necessitated the erection of a new pumping station, the work on which is now well under way. The site selected is at Wilson and Lamon avenues, adjoining the lines of two railways and nearly  $5\frac{1}{4}$  miles west of the lake. This will be known as the Mayfair station.



GASOLINE LOCOMOTIVE HAULING TRAIN OF LOADED CARS TO SHAFT.

much more economically and rapidly and more satisfactorily in every way than could have been done on the contract basis.

The rapid increase in population of the northern and northwestern parts of the city called for a greatly increased water supply in these districts. This was par-

To supply this station and also to furnish a new supply to the Lake View station was the primary object of the tunnel now under construction under Wilson avenue. It will extend to a new intake crib now being built in the lake about 3 miles from shore and directly east of Wilson avenue. The main tunnel is in a straight

east and west line and has a total length of 8.58 miles. From the new crib the first 5,800 feet of tunnel has a finished section equivalent to a circle 13 feet in diameter. At this point a short 8-foot branch tunnel will be built south to the old Lake View intake crib, which is to be dismantled. The remaining 39,500 feet of the main tunnel is to have a finished 12-foot bore. At the shore line another short 8-foot branch tunnel has already been built directly south to the Lake View pumping station. This station will therefore draw its supply from the new Wilson avenue crib and tunnel through either or both of these branch tunnels, the easterly one including continued use of the present Lake View lake tunnel.

At Lincoln avenue, about two miles west of the lake, a short stub tunnel with a gate will be built to permit construction in the future of a branch tunnel northwesterly under Lincoln avenue. Similar stubs have been provided at Lawndale avenue, to permit a future branch connection southward, and at Lamon avenue, to permit extending the Wilson avenue tunnel westward and beyond the new pumping station. The capacity of the entire Wilson avenue tunnel system will be 350,000,000 gallons per day.

Before deciding on the kind and depth of tunnel to be built, borings were made by employees of the city with two of the city's special drilling outfits. Along the land portion these were made about  $\frac{1}{4}$  mile apart and six were made in the lake portion. From these borings and survey data a profile was made. This indicated that at a depth of about 120 feet below street surface there was an apparently continuous solid limestone rock. The previous experience of the city with other tunnels proved that tunneling in the rock found at Chicago was much more economical and expeditious than tunneling through the treacherous clay and sandy soil nearer the surface. Therefore it was decided to bore the tunnel through solid rock at an average depth of about 165 feet below street surface. The excellent results obtained fully verify the wisdom of this decision. The chief advantages of this plan over tunneling in clay are that it eliminates the need for difficult and costly timbering and for working under compressed air; obviates the expensive and objectionable disposal of the excavated material, since continual haulage of wet clay through high-class residence districts is a public nuisance, and excavated rock really is an asset, rendering unnecessary the purchase of stone for the concrete lining.

The tunnel construction work was to be prosecuted from five shafts, one at the intake crib in the lake, one at the shore, two between the shore and Mayfair pumping station site, and one at the latter point. It was believed that proper construction methods would permit dispensing with an intermediate temporary crib or shaft in the lake portion, which had proven to be a source of danger in previous lake tunneling, resulting in the case of the Hyde Park lake tunnel in a very disastrous and fatal fire. The work was divided as follows:

Section I.—Intake crib and 2,000 lineal feet of 13-foot tunnel.

Section II.—Shore or Clarendon shaft and 3,800 feet of 13-foot tunnel, 17,500 feet of 12-foot tunnel and about 1,000 feet of 8-foot branch tunnel to Lake View pumping station.

Section III.—Lincoln avenue, Lawndale avenue and Mayfair shafts and 22,000 feet of 12-foot tunnel; also screen and suction tunnels for Mayfair station.

The need of completing this station expeditiously was urgent; therefore careful study was made of the best methods of prosecuting the work with dispatch.

Previous experiences of the city with tunnel construc-

tion by contract had proved unsatisfactory, chiefly for two reasons: first, the time limit set in the contract was almost invariably exceeded; second, numerous disputes and lawsuits had resulted from encountering unforeseen conditions. On similar work the contract time had been exceeded in some cases over 2 years. The city had successfully constructed by the day labor plan several difficult sections of smaller clay tunnels and it became the policy to do as much construction work on this basis as possible.

In September, 1913, the Construction Division of the Bureau of Engineering was requested to proceed with the sinking of the Clarendon shaft and building of short portions of the Wilson avenue tunnel in both directions. No serious difficulties were encountered. The construction of all of Section III by day labor was then decided on. It was at first thought not practicable to undertake Section II, which included the long lake portion, by day labor and proposals were therefore sought from contractors for this work. When these bids were opened in June 1914, the lowest figure was \$68.20 per lineal foot including engineering and inspection. These bids were rejected, and the city decided to build Section II also by day labor.

Since the city did not wish to purchase a plant for working in the lake, it was determined to let a contract for Section I. Bids were received for this section in December 1914, and the contract let to the Fitzsimons & Connell Dredge & Dock Co. The contract calls for completion of this part of the work by May 1918. Work was begun in January 1915.

On Section II the time limit set was forty-two months, from September 1914 to March 1918. All work on this section will undoubtedly be completed by March 1917, or one year ahead of schedule.

On Section III work began in April 1914 on the screen shafts. The first rock mining began on December 22, 1914. The tunnel connection between the Mayfair and Laundale shafts ( $1\frac{1}{2}$  miles) was all blasted out on December 15, 1915, and it is expected that all work on Section III will be completed by February, 1917.

At each of the four shafts, before sinking of shaft and actual tunneling could begin, a working plant had to be built. This consisted of a machine house of two stories, the first chiefly for three or four air compressors and one or two ventilating blowers, and the second for the men's lockers, dressing, washing and toilet rooms. These rooms are well equipped, steam heated with special coils for drying wet working clothes, and also have shower baths. At each shaft there is also an office, blacksmith shop, powder magazine, toolhouse and cement warehouse.

The headhouse at the top of each shaft was usually about 40 feet high and from it was built a trestle for running the cars to the rock pile, where the rock was piled up to a height of over 30 feet. At the shore shaft there is very limited room, since it lies directly between two bathing beaches; therefore no muck was stored here, but it was dumped into specially constructed bins capable of holding a night's accumulation and hauled away during the day by motor tractor trucks. At the Lincoln avenue shaft as soon as the rock pile had filled the entire large lot available, similar bins were also constructed.

Sinking of the shafts was done without special difficulty. At the shore shaft, however, a special  $\frac{3}{8}$  inch steel shell had to be sunk to a seal in the clay because of the sand, mostly water-bearing, encountered for about 20 feet at the top of the shaft. Sheet piling and bracing was put about an 18-foot square, the space within which was excavated. The steel shell was 13 feet 6 inches



in diameter and made up of 5 sections, each 6 feet high. These were riveted together and caulked, making the entire shell 30 feet high. The shell was internally braced and pig iron loaded on top. The bottom of the shell had a cutting edge. As the center was dug out the shell gradually sank until it sealed itself in the hard clay. Through this, wood lagging with caisson rings was used until rock was reached. The entire shaft was then given a concrete lining. It has remained perfectly tight and quite dry. The three other shafts did not require a steel shell.

Tunnel mining from the Mayfair shaft was carried out throughout the 24 hours of working days on the basis of 3 shifts of 8 hours each. It was desired to hasten this portion of the tunnel in order to complete it before work on the pumping station foundations would begin. Mining was arranged on what is known as the bottom heading and breakdown roof plan. In this 23 holes are drilled in the bottom heading and blasted; while the muck is being taken away 5 holes are drilled in the upper portion or roof. When these are blasted the roof is broken down easily. This method does not require so much drilling as the customary top heading and bench method, which is used at the 6 headings driven from the 3 other shafts. Each of these is operated on the two-shift basis of nominally 8 hours each. Since his portion of the tunnel runs exclusively under high-class residence districts, there was restriction of blasting during the night. The drilling consists of 28 to 34 holes in the top heading followed by 8 to 12 holes in the bench; the cut holes are 12 to even 15 feet deep. It is believed that for the rock encountered the top heading and bench method is preferable and lends itself to more rapid progress.

It was found that the two-shift plan is greatly superior to the three-shift. No greater progress per day was made by the triple shift, although it required many more men per day. This superiority is due chiefly to the more efficient work done on the two-shift system. This was planned so that a definite amount of work had to be done by each gang before quitting and no definite quitting time was set. The miners set up their drills, drill the holes and fire the blast. At the same

time the muckers must remove all the rock thrown down by the preceding blast. The men soon realize that by effective team work and attention to duty their working period is reduced. Although the work was laid out on the eight-hour basis, the muckers usually finish their tasks well within 7 hours and the miners within 7½ hours. The muckers are paid \$4.40 a day and the miners \$5; these figures exceed the wages paid by contractors on similar work.

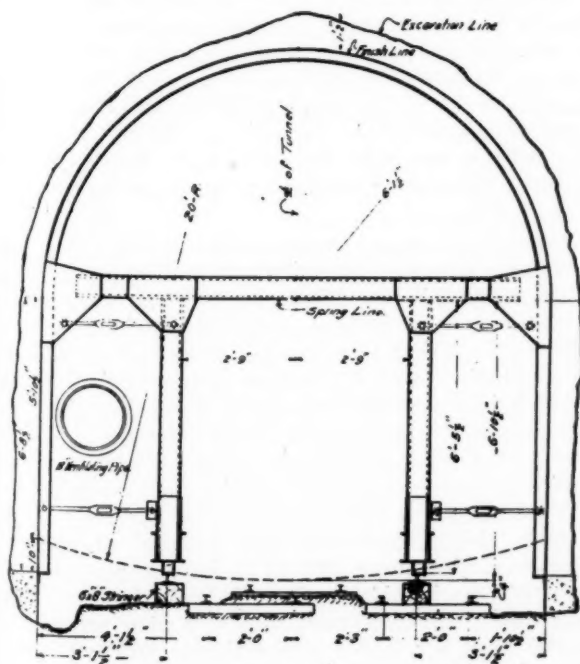
On the three-shift basis each gang takes up the work where the preceding gang left off and works only 8 hours. If there is negligence or loafing, it is almost impossible to secure proper evidence to place the responsibility, which is necessary before charges can be brought against any men, all of whom are under civil service.

The tunnel excavation has averaged about 20 feet per day in each drift; many days it was 22 to 23 feet and the maximum progress made in a day was 26 feet. The best previous average progress in a 12-foot rock tunnel in Chicago constructed by contract was about 8 feet a day. This rapid average progress made in the Wilson avenue tunnel would have been even greater but for the delays due to several wide faults that were encountered in the rock. These required heavy timbering and bracing followed by concreting to permit removal of the timber obstruction as soon as the mining through the section of clay was finished. For this purpose hand-mixed concrete was used.

All rock drilling is done by compressed-air drills which have 2½-inch cylinder diameter and are 10 to 15 feet long. Three different types of drills were tried out. No one type seems to be distinctively superior, each having certain advantages. Both the column and heading-bar methods of mounting the drills were tried, and the column method seems preferable. A drill-sharpening machine was installed that facilitated the important work of keeping the drills sharp and in proper condition. It is operated by one man, who easily does more and better work than four blacksmiths.

The compressed air for operating the drills and parts of the concreting plant to be described later in this article is obtained from Ingersoll-Rand compressors, of which 3 or 4 are installed at each shaft. They are driven by 100 horsepower electric motors at a speed of 190 revolutions per minute and have a capacity of 600 cubic feet of free air per minute at a normal pressure of 110 pounds per square inch. Adjoining the compressor is a receiver 4 feet in diameter and 12 feet high. The air is carried down the shaft in a 6-inch steel pipe and in the tunnel through 4-inch branch lines for most of the drifts; for the long lake drift running east from the shore shaft a 6 inch pipe line is used.

An important feature of the tunnel work is the care with which abundant ventilation is provided; this is much in excess of what has hitherto been furnished in similar work. For each drift there is provided at the shaft machinery house at least one General Electric centrifugal blower furnishing 5,000 cubic feet of air per minute at a pressure of 1½ pounds per square inch. These blowers are direct driven by 50 horsepower motors at a speed of 3,600 revolutions per minute. For the long lake drift, two of these blowers are run in series furnishing 5,000 cubic feet at 3 pounds pressure. The air is carried in 18-inch asphalt-coated steel piping down the shaft and at the side of the tunnel to within about 100 feet of the heading. This pipe is in 20 foot lengths and is light, but strong; two men can easily carry a length. It has special flanged ends for conveniently connecting with a leakproof rubber gasket. Normally the blower forces fresh air to the men working at the



GENERAL ARRANGEMENT OF TRACKS AND STEEL FORMS FOR CONCRETE LINING.

heading; during cold weather this air is heated by passing over steam coils. After a blast, the flow of air is reversed by means of a bypass, without reversing the blower, however, and the powder smoke is sucked out of the heading.

Water seeping into the tunnel before concreting and that used in connection with many of the rock drills is drained in a ditch at the side and pumped up the shaft by electrically driven centrifugal pumps operating against a head of over 150 feet. The 300-gallon size pumps are driven by 20-horsepower motors and the 1,000-gallon size by 75-horsepower motors.

The hoists at the shafts are of the single drum type and driven by 50-horsepower motors. With a load of 5,000 pounds the speed is 200 feet per minute. The single-skip method of hoisting is used because of its simplicity.

All electric power used for operating compressors, blowers, pumps, hoists, etc., is purchased from the Commonwealth Edison Company at an average cost of 1.3 cents per kilowatt hour. Electric power was deemed

more convenient, more reliable, and less objectionable to residents near the shafts than steam engine and boiler plants. The installation cost of the latter was thus eliminated also. Only a small low pressure boiler is provided at each shaft for heating purposes.

For hauling the muck out of the tunnel, double track is laid of 24-inch gauge using 20-pound rails on steel ties. A very rugged type of steel side-dump car having a capacity of one cubic yard is used; 300 of these cars are in service. At first mulé haulage was employed, but when the length of the drifts became so long as to make this method slow and costly a gasoline type of Baldwin mining locomotive was used. At a speed of 8 miles per hour these locomotives develop a draw-bar pull of 900 pounds. They have hauled as many as 57 loaded muck cars in one train and have proven very satisfactory, contrary to previous experience with gasoline locomotives in mining and tunnel work. By passing the exhaust gases through a water box the objectionable odors and smoke are removed.

(To be continued.)

## WATERWORKS STATISTICS FOR 1915

Returns to Municipal Journal by More Than Six Hundred Water Works Officials—Numbers and Sizes of Meters Installed During 1915—Percent of Services Metered—Distribution Systems—Sterilizing Water.

In conformity with our custom, established some years ago, we have collected during the past month statistics from water works, both municipal and private, for the year 1915 or the latest fiscal year. The water works officials in more cities than ever have replied to our inquiries, considerable over 600 reports having been received at this writing, while every mail brings additions.

Partly because of the large number of cities represented in the tables which we have compiled from the data sent in by the officials, and because of the bulk which would be given to any one issue which contained all of these tables in addition to the other matter, we have decided this year to distribute the tables over two or three consecutive issues of Municipal Journal, and this week are including only those which apply to meters.

The information given in these tables is obtained from the replies returned by water works officials to questions sent to them by us. The information given is therefore official and although those filling in the blanks may occasionally make a slip of the pen or a mis-statement and either the editorial department or the printer may occasionally make a mistake in transferring the information to the tables, we believe that very few erroneous statements will be found in the tables. We urge any who may find any errors to notify us at once in order that we may publish corrections in the next issue. We may say that we have made similar requests for several years back and have never had more than three or four errors in one set of tables called to our attention; from which we concluded that, of the thousands of figures published, a minute fraction of 1 per cent are incorrect.

The questions asked in connection with meters, from the replies to which these tables have been compiled, were as follows: "What number of meters were set during the year 1915, giving sizes and number of each size?" "What percentage of services are metered?" "What percentage of water delivered to mains is accounted for by meters?" "What is your maximum net meter rate?" "What is your minimum net meter rate?" "Do you include in the rate a fixed charge ('meter rental,' 'service charge,' etc.), and if so, what is it?"

There appears to have been, in a few cases, a misunderstanding of what was intended by the question: "What percentage of water delivered to mains is accounted for by meters?" A few cities have replied that 100 per cent is so accounted for. It is well known that there is probably no system in the world in which there is not some leakage, in which some meters do not under-register, and in which therefore, for these and other reasons, there is not a greater or less percentage of the water entering the mains which is not registered by the service meters. Consequently it seems improbable that 100 per cent of the water delivered to the mains is accounted for in any system by the service meters. We presume, therefore, that where this reply is given it must refer to a Venturi or other large meter placed at the pumping station or reservoir, through which the water passes before entering the distribution system. In the majority of cases, however, the percentages given for services metered and for the percentage of water accounted for appear to be consistent. It is, of course, to be expected that the latter would be larger than the former, because most cities place their first meters on the services of their largest consumers.

Of special interest are the figures indicating percentages of services metered. The number of cities reporting all services metered is surprisingly large. Although we know that the growth of general metering was increasing, we hardly realized that 15 per cent of the cities and towns of the country were 100 per cent metered. And yet this is what is indicated by the returns from these 600 cities of all sizes and from all parts of the country.

The tables to appear in the issue of next week and possibly one or two weeks following will contain information as to mains and appurtenances thereto laid during 1915, giving the length and material of each size laid, cost of pipe alone, cost of laying the pipe, depth at which the pipe is laid, number of fire hydrants and gate valves and other appurtenances set; also the kind of material used for house connections. Other questions had to do with corrosion of mains and the cleaning of them, and the sterilizing of water.



	Percentage of water		METERS SET IN 1915								
	Percent- metered	delivered to mains account- ed for	1/4 inch	3/4 inch	1 inch	1 1/4-1 1/2 in.	2 inch	3 inch	4 inch	6 inch	Misc. sizes
<b>Alabama:</b>											
Anniston	75	Not known	1442	12		2	4		6	10	13
Dothan	95		207								
Gadsden	100	70	20				2	1			
Jacksonville	3 meters	4				2	1				
Mobile			2163 <sup>2</sup>								
Selma	100		40								
Talledega	100	80	24								
Union Springs	50										
<b>Arizona:</b>											
Douglas	100	85	500				6	4			
<b>Arkansas:</b>											
Eldorado	67	Not known	30								
Fordyce	50		15								
Fort Smith	30										
Hot Springs	100	70									
Jonesboro	15										
Monticello	98	90	20	18		2					
Wynne	90	Not known	200				3				
<b>California:</b>											
Glendale	100		136								
Lodi	0.05	Less than 3			12	2	6	3			
Oxnard	5 meters										
Riverside	10		24								
San Diego	100	95	376								
Santa Ana	85	50	100		16	11	12	1	1	4	1 <sup>1</sup>
Santa Monica	100	89.9	182	4		6	3				
Santa Rosa			107	15	7	2	14				
Stockton	15	26	209 <sup>2</sup>						2	1	
Whittier	25-30	65		75	15	4	6		1		
<b>Colorado:</b>											
Colorado Springs	1.98										
Greeley	5		31	8							
Montrose	10	None		2		1	1			2	
<b>Connecticut:</b>											
Ansonia	33	65	97								
Bristol	83	65	99	4							
Danbury	None	None		1	1						
East Hartford	7		4								
Hartford	98.5		310				1				
New Britain	99	75	140 <sup>3</sup>	256	77	16	2	7	13		
New Haven	12		3860 <sup>2</sup>								
New London	35	43	618								
Norwalk	4			5	1	1	1	1		2	
Portland	5										
Putnam	10	33									
Southington	6.7	25	3								
Suffield	100	Prac. all	10		1						
Wallingford	17	Not known	19	4			1				
Watertown	12	Not any					1				
Willimantic	90	90	65								
Windsor	3										
Winsted	4										
<b>Florida:</b>											
Daytona	100	Not known	66								
Lake City	80	50	50		4						
Live Oak	85	95	500								
Orlando	10	Not known	14				3		2		
Palatka	30	60			5		2				
Pensacola	85	60	150								
Plant City	100	50									
Sarasota	90	85	130								
Starke	2.5	10	140	6			2				
<b>Georgia:</b>											
Americus	45		43		5		3				
Athens	100		80								
Atlanta	100	72	1027	23	9			3	3		
Commerce	50		15								
Decatur	100	60	64		1						
Fort Valley	90	80	75		5						
Griffin	99	77	95	4							
La Grange	100	98	263			1	1	2	1	1	
Marietta	100					6					
Milledgeville	50	60	12								
Moultrie	90	85	70				4				
Thomasville	100			4		1	1				
Waynesboro	90	60	30 <sup>3</sup>	40	2	3					
<b>Idaho:</b>											
Sandpoint	2.5										
Weiser	100		23								
<b>Illinois:</b>											
Decatur	99.9	75	256		1	1	2	3	1	2	
De Kalb	100 <sup>5</sup>	60	44				1				
Elgin	99	85	171	26	6		2				
Evanston	37	21	127	8	11	8	7	1			
Farmington	75		20		1						
Galesburg	100	80	196	2	7	1		1			
Harvard	100	75	92		2						
Joliet	100	60	15							2	
Kewanee	100	65-70	52	3	1						
Lewiston	85	80-90	25		1				1		
Lincoln	43		87								
Metropolis	1 meter										
Mt. Carmel	4		10	6			4	1	3		
Mt. Olive	20	20						1			
Mt. Vernon	60	90	75	3	2		1				
Naperville	100	Not known									
Normal	100	50	50								
Oak Park	100	87	558	12	10	7	10		1		
Olney	98	No data	38				1			1	
St. Charles	100	Not known	150	6	2		3			1	
Savanna	10	7									
Streator	25	50	593 <sup>3</sup>								
Watseka	100		40				1				

## METERS SET AND IN SERVICE—Continued.

	Percent- age of services metered	Percentage of water delivered to mains account- ed for	METERS SET IN 1915								
			5/8 inch	3/4 inch	1 inch	1 1/4-1 1/2 in.	2 inch	3 inch	4 inch	6 inch	Misc. sizes
Indiana:											
Batesville	100	100	....	5	....	....	....	....	....	....	....
Bedford	....	60	50	....	....	....	....	....	....	....	....
Bluffton	....	....	25	....	....	....	....	....	....	....	....
Brazil	100	....	....	....	....	....	....	1	....	....	....
Clinton	10	7	....	....	....	....	....	....	....	....	....
Elwood	50	40	66	....	....	....	....	....	....	....	....
Evansville	17	28.4	1452	386	51	9	11	....	....	1	....
Fairmount	5 meters	....	....	2	....	....	....	....	....	....	....
Greenfield	50	50	....	....	....	....	....	....	....	....	....
Huntington	100	50	93	....	....	....	....	....	....	....	....
Jeffersonville	15	....	50	....	....	3	....	....	....	....	....
Lebanon	60	39	335	5	1	1	3	2	....	....	....
Linton	10	....	....	....	....	....	....	....	....	....	....
Mishawaka	80	30	700	....	....	....	2	....	2	....	....
Montpelier	60	50	....	....	....	....	....	....	....	....	....
New Castle	12	....	100	12	8	....	6	....	1	....	....
Peru	....	....	14	....	....	....	....	....	....	....	....
Plymouth	100	....	39	....	....	....	....	....	....	....	....
Portland	0.5	....	2	....	....	....	....	....	....	....	....
Richmond	65	....	125 <sup>2</sup>	....	....	....	....	....	....	....	....
Rushville	90	80	200	....	....	....	....	....	....	....	....
Seymour	....	35	22	75	6	2	6	3	....	....	....
South Bend	40	20	673	....	....	2	6	....	1	1	....
Terre Haute	92	....	....	....	....	....	....	....	....	....	....
Washington	30	49	40	....	....	2	1	....	1	....	....
West Lafayette	10	10	....	14	1	3	....	....	....	....	....
Iowa:											
Albia	100	....	30	....	....	....	....	....	....	....	....
Atlantic	15	....	40	10	2	1	2	....	....	....	....
Belle Plaine	100	Not known	38	....	....	....	....	....	....	....	....
Boone	100	75	120	4	....	....	....	....	....	....	....
Burlington	4.6	21.75	....	4	1	3	1	....	1	....	....
Cedar Falls	65	25	212	....	....	....	....	....	....	....	....
Cedar Rapids	99	Not known	....	....	....	....	....	....	....	....	....
Charles City	100	70	55	....	....	....	....	....	....	....	....
Cherokee	100	75 Not kno'n	....	....	....	....	....	....	....	....	....
Chariton	100	....	38	2	....	....	....	....	....	....	....
Creston	94	....	106	....	....	....	....	....	....	....	....
Des Moines	99.1	....	....	....	....	....	....	....	....	....	....
Dubuque	98	....	297	....	....	....	....	....	....	....	....
Estherville	99	....	314	....	....	5	3	....	....	....	....
Glenwood	90	95	15	....	....	....	....	....	....	....	....
Harlan	60	No record	44	....	....	....	....	....	....	....	....
Maquoketa	100	No record	48	12	....	....	....	....	....	....	....
Marshalltown	71	60	264	1	5	1	....	....	....	....	....
Mason City	100	80	106	1	....	....	1	....	1	....	....
Missouri Valley	10	1	2	....	....	2	....	....	....	....	....
Mount Pleasant	95	....	40	....	1	1	....	1	....	....	....
Muscatine	50	....	150	....	....	....	....	....	....	....	....
Osage	100	....	48	....	....	....	....	....	....	....	....
Osceola	100	....	....	....	....	....	....	....	....	....	....
Sioux City	100	....	548 <sup>2</sup>	....	....	....	....	....	....	....	....
Washington	100	....	30	....	....	....	....	....	....	....	....
Webster City	75	50	390	....	5	....	....	....	....	....	....
Winterset	100	....	50	....	....	....	....	....	....	....	....
Kansas:											
Abilene	95	95	1300	....	....	....	....	....	....	....	....
Caney	75	50	90	....	....	....	....	....	1	....	....
Clay Center	99	No record	50	....	....	....	....	....	....	....	....
Columbus	65	40	76	....	....	....	....	....	....	....	....
Garden City	85	....	20	....	1	....	....	....	....	....	....
Girard	80	55	36	....	....	....	....	....	....	....	....
Hiawatha	100	65	52	....	....	....	....	....	....	....	....
Horton	100	....	24	....	....	....	....	....	....	....	....
Independence	....	....	900	....	50	6	8	3	3	....	....
Larned	99	70	30	....	4	....	....	....	....	....	....
Manhattan	100	No record	150	25	2	2	1	1 <sup>1</sup>	....	....	....
McPherson	100	....	55	....	....	4	2	....	....	....	....
Mulberry	20	....	20	....	....	....	....	....	....	....	....
Neodesha	15	20	50	....	....	....	....	....	....	....	....
Osage City	100	95	47	....	....	....	....	....	....	....	....
Osawotomie	75	90	30	....	....	....	....	....	....	....	....
Pittsburg	25	50	40	....	....	....	....	....	....	....	....
Kentucky:											
Frankfort	....	....	100 <sup>2</sup>	....	....	....	....	....	....	....	....
Hopkinsville	51	72	63	2	1	....	....	....	....	....	....
Lexington	100	92	504	1	9	6	4	3	3	....	....
Mayfield	9 meters	....	....	....	....	....	....	....	....	....	....
Middlesborough	33	65	....	....	10	....	....	....	....	....	....
Nicholasville	42	20	22	....	1	1	....	....	....	....	....
Paris	....	....	....	....	....	....	3	....	....	....	....
Princeton	100	100	75	....	....	....	....	....	....	....	....
Louisiana:											
Alexandria	100	75	....	....	....	....	....	....	....	....	....
Lafayette	....	60	25	....	10	....	....	....	....	....	....
Minden	50	25	75	....	....	....	....	....	....	....	....
Morgan City	3	5	....	....	....	....	....	....	....	....	....
Natchitoches	80	75	20	20	....	....	....	....	....	....	....
New Iberia	15	15	30	10	5	3	....	....	....	....	....
Ruston	90	....	25	....	....	....	....	....	....	....	....
Maine:											
Augusta	....	....	6	1	....	....	3	....	....	1	1 <sup>6</sup>
Bath	12.5	....	9	1	....	....	....	....	....	....	....
Rumford	8	....	5	....	1	....	....	....	....	....	....
South Paris	7 meters	....	....	....	....	....	....	....	....	....	....
Waterville	2	15	....	6	2	....	1	....	....	....	....

For footnotes, see page 753.



## METERS SET AND IN SERVICE—Continued.

	Percent- age of services metered	Percentage of water delivered to mains account- ed for	METERS SET IN 1915								Misc.
			¾ inch	¾ inch	1 inch	1¼-1½ in.	2 inch	3 inch	4 inch	6 inch sizes	
<b>Maryland:</b>											
Baltimore	3.5	36	292	378	41	27	22	13	6	1	
Chestertown	1	...	8	...	2	...	2	1	...	...	
Frederick	5	...	...	...	3	...	...	...	...	...	
<b>Massachusetts:</b>											
Attleboro	100	51	62	1	3	...	...	...	...	...	
Barre	12	...	...	...	...	...	...	...	...	...	
Belmont	100	82.5	99	...	1	...	3	2	1	...	
Brockton	99	75.4	269	9	3	...	3	...	...	...	
Cherry Valley (Rochdale)	50	...	36	15	4	...	3	...	...	...	
Cohasset	...	...	20 <sup>2</sup>	...	...	...	...	...	...	...	
Concord	3.4	29.8	...	...	...	...	...	...	...	...	
Easthampton	75	45	250	4	2	...	3	1	...	...	
Everett	50	...	294	3	5	...	2	...	...	...	
Fitchburg	98.5	...	95 <sup>2</sup>	...	...	...	...	...	...	...	
Foxborough	90	...	40	...	...	...	...	...	...	...	
Framingham	100	75	102	2	2	10	6	1	1	...	
Haverhill	29.35	17.83	245	17	10	3	3	...	...	...	
Lenox	40	20	50	28	11	2	8	1	...	...	
Lowell	87	54	344 <sup>2</sup>	...	...	...	...	...	...	1	
Lynn	50	...	211	126	22	5	6	...	...	...	
Maynard	90	...	...	...	...	...	...	...	...	...	
Middleboro	100	...	17	...	...	...	2	...	...	...	
Natick	80	38	88	...	...	...	6	4	5	2	
New Bedford	100	88	332	102	16	...	...	...	...	...	
Newburyport	3	15	...	...	3	...	1	...	...	...	
North Adams	90	55	49	5	...	...	...	...	...	...	
North Andover	100	78	17	...	...	...	...	...	...	...	
North Attleboro	...	...	...	...	...	...	...	...	...	...	
Northampton	4	...	...	...	...	...	...	...	...	...	
Orange	100	60	11	...	...	...	...	...	...	...	
Oxford	43	...	50	...	...	...	...	...	...	...	
Reading	93.5	59	52	...	...	...	...	...	...	...	
Spencer	95	...	...	...	...	...	...	...	...	...	
Springfield	97.6	75.40	325	82	40	21	16	12	11	2	
Taunton	59.5	56	135	1	4	13	...	...	...	...	
Walpole	83	60	82	4	...	...	...	...	...	...	
Webster	65	...	29	...	...	...	...	...	...	...	
Wellesley	100	57	92	3	1	...	...	...	...	...	
Weymouth	40	No record	976	1	...	...	1	...	...	...	
Williamstown	100	...	416	10	7	2	9	3	...	1	
Winthrop	100	81	61	21	...	...	...	...	...	...	
Worcester	98	80	587 <sup>2</sup>	...	...	...	...	...	...	...	
<b>Michigan:</b>											
Alma	75	75	...	...	...	...	...	...	...	...	
Boyne City	10	20	14	...	...	...	...	...	...	...	
Dowagiac	100	40	25	...	...	...	...	...	...	...	
Flint	86	No record	3760	...	14	9	11	7	2	...	
Holland	100	59	93	...	...	2	1	...	...	...	
Houghton	100	60	12	...	...	...	...	...	...	...	
Iron Mountain	40	60	700 <sup>2</sup>	...	...	...	...	...	...	...	
Ishpeming	80	...	10	...	3	...	1	...	...	...	
Ludington	88	41	43	...	3	...	3	2	...	3 <sup>3</sup>	
Lansing	72	...	1200	12	...	...	...	...	...	...	
Marquette	50	...	61	15	...	...	...	...	...	...	
Manistique	3	...	...	...	...	...	...	...	...	...	
Mt. Clemens	98	...	60	...	4	...	...	...	...	...	
Niles	86	Not known	600	...	...	...	...	1	...	...	
Norway	20	25	...	3	...	...	...	...	...	...	
Paw Paw	...	95	8	...	...	...	...	...	...	...	
Red Jacket	100	100	...	...	2	4	3	1	...	...	
Saginaw	4	10	...	...	...	...	...	...	...	...	
South Haven	98	...	15	...	1	...	...	...	...	...	
Traverse City	40	...	75	...	...	...	...	...	...	...	
Yale	5	Not known	...	...	...	...	...	...	...	...	
<b>Minnesota:</b>											
Chisholm	...	...	...	...	...	1	1	...	1	...	
Cloquet	100	50	60 <sup>2</sup>	...	...	...	...	...	...	...	
Duluth	85	55	1102 <sup>2</sup>	...	3	...	...	...	...	...	
Fairmont	100	...	128	...	...	...	2	...	...	1 <sup>1</sup>	
Lake City	99.5	62	11	...	1	1	...	...	...	...	
Mankato	100	50	76	1	...	...	...	...	...	...	
Melrose	10	10	10	...	...	...	...	...	...	...	
Minneapolis	90	...	...	...	...	...	...	...	...	...	
Moorhead	100	...	50	...	...	...	...	...	...	...	
New Ulm	100	60	45	...	5	2	1	...	...	...	
Northfield	97	...	31	3	...	...	...	...	...	...	
Owatonna	6	20	67	...	1	...	...	...	...	...	
Saint Paul	84.8	61.1	...	2560 <sup>2</sup>	...	...	4	...	...	...	
So. Saint Paul	100	100	750	20	15	...	...	...	...	...	
Staples	100	...	8	...	...	...	...	...	...	...	
Two Harbors	0.6	30	...	...	...	...	...	...	...	...	
Worthington	10	...	...	...	...	...	...	...	...	...	
<b>Mississippi:</b>											
Clarksdale	100	75	130	...	...	...	3	...	...	...	
Gulfport	1	...	10	...	...	...	...	...	...	...	
Jackson	60	38	195	...	6	2	2	...	2	...	
Natchez	92	25	25	...	...	...	...	...	...	...	
Water Valley	100	...	...	...	...	...	...	...	...	...	
<b>Missouri:</b>											
Boonville	32	...	14	...	3	1	1	...	...	...	
Brookfield	100	40	36	...	50	15	25	6	...	1	
Cape Girardeau	100	...	400	...	...	...	...	...	...	...	
Carrollton	20	15	...	...	...	...	...	...	...	...	
Carthage	100	100	150	2	...	2	...	...	...	...	
Fulton	60	No record	30 <sup>2</sup>	...	...	...	...	...	...	...	
Higginsville	45	...	10	...	...	...	...	...	...	...	
Macon	20	...	...	...	...	...	...	...	...	...	
Marshall	100	50	73	2	...	...	1	...	...	...	
Slater	95	...	25	...	...	...	...	...	...	...	
Trenton	100	65	450	...	...	...	...	...	...	...	
Washington	65	65	20	...	...	...	...	...	...	...	
West Plains	95	55	31	...	...	...	...	...	...	...	

For footnotes, see page 756.

## METERS SET AND IN SERVICE—Continued.

	Percent- age of services metered	Percentage of water delivered to mains account- ed for	METERS SET IN 1915								Misc. sizes
			½ inch	¾ inch	1 inch	1¼-1½ in.	2 inch	3 inch	4 inch	6 inch	
<b>Montana</b>											
Billings	20	....	42	4	8	....	1	....	....	....	....
Deer Lodge	....	....	12	9	1	....	....	....	....	....	....
Glendive	6.5	....	100 <sup>2</sup>	....	....	....	....	....	....	....	....
Helena	62.5	....	450	....	7	2	3	....	....	....	....
Kalspell	50	No data	4	5	....	....	....	....	....	....	....
Livingston	5	....	....	....	....	....	....	....	....	....	....
<b>Nebraska</b>											
Auburn	100	100	30	2	....	1	1	....	....	....	....
Aurora	85-90	No data	33	....	1	....	....	....	....	....	....
Columbus	100	85	30	....	3	....	1	....	....	....	....
Fairbury	100	85	50	....	....	....	....	....	....	....	....
Hastings	100	....	888	6	2	....	....	....	....	....	....
Holdrege	98	....	21	....	....	....	2	....	....	....	....
Schuyler	100	....	265	30	10	....	2	....	....	....	....
<b>New Hampshire</b>											
Berlin	20	16	24	4	....	2	....	....	....	....	....
Claremont	75	....	84 <sup>2</sup>	....	....	....	....	....	....	....	....
Concord	63.7	....	72	....	....	....	....	....	....	....	....
Dover	78.7	....	41	2	1	....	1	1	....	....	....
Franklin	100	....	5	....	....	....	....	....	....	....	....
Lebanon	43	....	13	....	....	....	....	....	....	....	....
Keene	98.5	....	1330	156	11	7	....	2	....	....	....
Milford	50	50	20	1	....	....	....	....	1	1	....
<b>New Jersey</b>											
Dover	87	....	100	....	....	....	....	....	....	....	....
Irvington	86	70	208	....	4	....	1	....	....	1	....
Jersey City	21.5	75	1050 <sup>2</sup>	....	....	....	....	....	....	....	....
Newton	70	....	50	10	....	....	....	....	....	....	....
Milltown	100	....	118	....	1	2	1	....	....	....	....
Perth Amboy	....	54	799 <sup>2</sup>	....	....	....	....	....	....	....	....
Pleasantville	25	25	....	....	....	....	....	....	....	....	....
Rahway	40	40	....	....	....	....	....	....	....	....	....
Ridgewood	....	.01	....	....	....	....	....	....	....	....	....
So. Orange	95	....	226	5	8	....	1	....	....	....	....
Trenton	24	....	581	350	36	2	9	9	....	....	....
Verona	100	75	32	....	1	....	2	1	1	....	....
Wallingford	30	No record	40	....	1	....	3	....	1	....	....
West Orange	99	87	122	....	....	....	....	....	....	....	....
<b>New York</b>											
Beacon	100	....	125	2	....	....	1	....	....	....	....
Binghamton	....	....	....	....	....	....	....	....	....	....	....
Brooklyn (N. Y. City)	15	....	1090 <sup>2</sup>	....	....	....	....	....	....	....	....
Carthage	50	33	....	25	....	....	....	....	....	....	....
Corning	99.8	....	104	....	....	....	....	....	....	....	....
Cortland	82	34	248	2	1	1	2	....	....	....	....
Elmira	64	No data	1322	....	....	....	....	....	....	....	....
Fort Plain	8	....	....	....	....	....	....	....	....	....	....
Frankfort	90	80	41	....	....	1	....	....	....	2	....
Glens Falls	....	....	2	....	....	....	1	....	....	....	....
Homer	10	small	7	....	....	....	....	....	....	....	....
Hoosick Falls	21 meters	....	....	....	2	....	1	....	....	....	....
Jamestown	95	65	....	....	....	....	....	....	....	....	....
Lancaster	100	85	60	....	....	....	....	....	....	....	....
Little Falls	20	Not known	....	....	....	....	....	....	....	....	....
Mount Vernon	100	40	195	10	2	2	....	1	....	2	....
Newark	70	....	....	....	....	....	....	....	....	....	....
Ossining	90	....	36	....	....	....	....	....	....	....	....
Oswego	less than 10	....	....	....	....	....	....	....	....	....	....
Peekskill	80	....	50	....	....	....	....	....	....	....	....
Plattsburgh	5	not known	....	....	....	2	....	....	....	1	1 <sup>6</sup>
Port Jervis	....	....	1	3	3	....	....	....	....	....	....
Poughkeepsie	100	60	359	10	1	1	....	....	1	2	....
Salamanca	2	....	....	....	....	....	....	....	....	....	....
Schenectady	6	....	1	275	8	2	1	....	1	....	....
Seneca Falls	0.37	No data	2	....	....	....	....	....	1	....	....
Solvay	100	70	40	....	....	....	....	....	....	....	....
Tarrytown	100	50	15	1	1	....	1	....	....	....	....
Tonawanda	25 meters	....	....	....	....	....	....	....	....	....	....
Waterloo	25	....	37	....	1	....	1	....	....	....	....
Waverly	33	50	38	....	....	....	....	....	....	....	....
Yonkers	100	66	209	5	7	2	1	1	....	....	....
<b>North Carolina</b>											
Gastonia	79	57	116	....	....	....	3	....	....	....	....
Oxford	100	....	60	....	2	....	1	....	....	....	....
Salisbury	80	50	50	....	8	....	....	....	....	....	....
Wilmington	20	....	100	....	....	....	....	....	....	....	....
<b>North Dakota</b>											
Bismarck	90	70	82	4	2	....	....	....	....	....	....
Fargo	75	....	....	....	....	....	....	....	....	....	....
Mandan	100	80	70	....	....	3	....	....	....	....	....
Wahpeton	3	10	....	....	....	....	....	....	....	....	....
Williston	3	3	20	10	4	2	1	....	....	1	....
<b>Ohio</b>											
Ashland	98	....	130	....	....	2	1	....	....	....	....
Barberton	90	85	300	....	2	4	....	....	1	....	....
Barnesville	100	....	53	3	2	....	....	....	....	....	....
Bellefontaine	0.5	....	43	....	....	....	....	....	....	....	....
Bryan	80	....	....	....	....	....	....	....	....	....	....
Celina	5	....	....	....	....	....	....	....	....	....	....
Cleveland	98.78	86.11	3611	5	81	29	25	25	11	5	1 <sup>6</sup>
Columbus	95.45	63.9	1627	94	18	5	5	2	2	2	1 <sup>6</sup>
Conneaut	69	69	40	34	2	....	1	....	....	....	....
Coshocton	5	....	....	....	....	....	....	....	....	....	....
Cuyahoga Falls	99	75	129	....	....	....	....	....	....	....	....
Dayton	100	51	....	....	....	....	....	....	....	....	....
Delaware	65	45	80	....	....	....	....	....	....	....	....
East Cleveland	100	87	430	....	3	....	2	....	1	3	....
Eaton	44	44	15	....	....	....	....	....	....	....	....
Gallipolis	75	80	13	1	....	....	....	....	....	....	....
Girard	75	50	50	....	....	....	....	....	....	....	....
Gloucester	20	20	40	....	....	....	....	....	....	....	....
Granville	33	67	18	....	....	....	....	....	....	....	....
Hamilton	85	75	300	120	30	....	4	....	1 <sup>1</sup>	....	1 <sup>6</sup>
Huron	2 meters	....	....	1	....	....	....	....	....	....	....
Kent	100	70	70	....	....	....	....	....	....	....	....

For footnotes, see page 753.



## METERS SET AND IN SERVICE—Continued.

	Percent- age of services metered	Percentage of water delivered to mains account- ed for	METERS SET IN 1915								Misc. sizes
			¾ inch	¾ inch	1 inch	1¼-1½ in.	2 inch	3 inch	4 inch	6 inch	
Lancaster	86	...	300	...	...	...	...	...	...	...	...
Logan	few	...	125	...	...	...	...	...	...	...	...
Marietta	20	...	125	...	...	...	...	...	...	...	...
Marion	96	...	199 <sup>2</sup>	...	...	...	...	...	...	...	...
Massillon	61	47	224	1	3	1	1	...	...	...	...
Medina	100	80	75	...	1	...	1	...	...	...	...
Middletown	65	...	361	...	4	1	1	...	...	...	...
Mt. Gilead	90	80	...	...	...	...	...	...	...	...	...
Mt. Vernon	10	5	...	...	...	...	...	...	...	...	...
Niles	10	...	...	...	...	...	...	...	...	...	...
St. Marys	50	50	100	...	2	...	4	...	...	...	...
Sandusky	100	100	282	10	9	2	5	2	...	...	...
Sidney	100	...	...	...	...	...	...	...	...	...	...
Shelby	65	30	...	...	...	...	...	...	...	...	...
Tiffin	90	...	215	1	2	...	...	...	...	...	...
Toledo	78.5	71.2	2887	39	52	9	7	10	10	1	...
Toronto	10	25	...	...	...	...	...	...	...	...	...
Troy	40	...	...	...	...	...	...	...	...	...	...
Urbana	15	...	80	...	...	...	...	...	...	...	...
Warren	87.5	50	360	40	110	10	15	...	...	...	...
Washington C. H.	30	25	52	...	3	...	...	...	...	...	...
Wauseon	85	...	90	...	...	...	2	...	...	...	...
Xenia	10	25	12	10	...	...	2	...	...	...	...
<b>Oklahoma</b>											
Chickasha	97	75	35	...	...	...	...	...	...	...	...
Clinton	90	50	24	...	...	...	...	...	...	...	...
Guthrie	94.4	50	...	...	...	...	...	...	...	...	...
Kingfisher	100	85	30	...	2	...	...	...	...	...	...
McAlester	90	90	40	6	2	1	2	...	...	...	...
Muskogee	90	...	230	...	...	...	...	...	...	...	...
Stillwater	100	None	30	...	...	...	...	...	...	...	...
<b>Oregon</b>											
Corvallis	100	...	...	275	1	...	4	...	...	...	...
Eugene	80	50	700	...	10	...	...	...	...	...	...
Hood River	8 meters	...	...	...	...	...	...	...	...	...	...
Marshfield (So. Bend)	5	10	4	...	2	...	...	...	...	...	...
Medford	5	less than 1	10	...	...	...	...	...	...	...	...
The Dalles	10 meters	...	...	...	...	...	...	...	...	...	...
<b>Pennsylvania</b>											
Allentown	...	0.40	...	...	...	...	...	...	...	...	...
Aspinwall	100	76.2	16	...	...	...	...	...	...	...	...
Barnesboro	8	4	...	...	...	...	...	...	...	...	...
Carbondale	...	33	...	6	...	2	...	...	1	1	...
Catasauqua	10 meters	...	1	...	...	...	...	...	...	...	...
Chambersburg	34.5	50	298	8	1	1	6	...	...	...	...
Chester	100	80	...	...	...	...	...	...	...	...	...
Duquesne	100	...	68	...	...	...	...	...	...	...	...
Emporium	...	3	...	...	...	...	...	...	...	...	...
Franklin	1.5	...	...	...	...	...	...	...	...	...	...
Elizabethtown	80	75	28	2	...	...	...	...	...	...	...
Gettysburg	...	...	3	4	...	...	...	...	...	...	...
Greensburg (Jeannette, etc)	70-96	...	397	5	...	1	...	1	...	...	...
Harrisburg	82	...	445	23	8	3	4	2	...	...	...
Indiana	75	Not known	50	10	...	...	...	...	...	...	...
Jersey Shore	...	...	2	...	...	...	2	...	...	...	...
Lancaster	52	46	410	7	5	1	3	2	...	...	...
Lehigh	15 meters	25	...	2	...	1	1	...	...	...	...
Media	2	...	...	...	...	...	...	...	...	...	...
Meyersdale	20 meters	...	...	...	...	...	...	...	...	...	...
Minersville	...	33	...	...	...	...	...	...	...	...	...
Norristown	0.5	35	15	...	2	...	1	...	1	...	...
Pittsburgh	22	...	4725	1241	646	110	105	54	20	3	...
Reading	24.7	33	1071	32	42	5	11	2	5	2	1 <sup>6</sup>
Ridgway	73	89	60	5	3	...	...	...	...	...	...
Sayre	33	...	150	...	...	...	...	...	...	...	...
Sewickley	...	1	3	2	1	...	...	...	...	...	...
Sharpsville	100	...	...	620	...	...	...	...	...	...	...
Shenandoah	2	...	...	...	...	...	...	...	...	...	...
Steelton	100	50	35	5	...	...	...	...	...	...	...
Susquehanna	few	...	2	4	...	...	...	...	...	...	...
Titusville	20	...	12	...	...	...	...	...	...	...	...
West Newton	40	50	35	25	...	...	...	...	...	...	...
Wilkinsburg	98.8	75-82	...	...	...	...	...	...	...	...	...
<b>Rhode Island</b>											
Bristol	2	33	4	...	3	...	4	...	...	...	...
E. Providence	...	...	56	...	...	...	...	...	...	...	...
Providence	92	No data	685	56	12	5	19	5	4	4	...
Westerly	91	...	166	8	...	...	1	...	...	...	...
Woonsocket	97.6	83.2	122	...	15	...	...	...	...	...	...
<b>South Carolina</b>											
Camden	40	...	15	...	...	1	...	...	...	...	...
Clinton	100	75	26	2	1	...	...	...	...	...	...
Columbia	99	85	...	...	2	1	...	...	...	...	...
Florence	70	...	38	...	...	...	...	...	...	...	...
Orangeburg	60	30	64	...	3	2	...	...	...	...	...
<b>South Dakota</b>											
Aberdeen	65	...	1300	...	24	1	1	...	1	...	...
Brookings	100	No data	60	...	...	...	...	...	...	...	...
Mitchell	100	50	690	5	5	...	...	...	...	...	...
Rapid City	75	65	50	...	...	...	1	...	...	...	...
Watertown	100	95	52	...	2	...	1	...	...	...	...
<b>Tennessee</b>											
Clarksville	33	25	35	8	6	1	...	...	...	...	...
Dyersburg	5	No data	6	1	...	...	1	...	...	...	...
Franklin	100	...	48	...	...	...	...	...	...	...	...
Greenville	15	...	...	...	...	...	...	...	...	...	...
Humboldt	5	33	18	...	...	2	...	1	...	...	...
Johnson City	3.5	19.3	69	...	4	...	9	1	1	2	...
Memphis	75	40	1734	12	6	4	8	2	1	...	...
Murfreesboro	65	50	22	1	4	...	...	...	...	...	...
Tullahoma	10	...	5	...	...	...	...	...	...	...	...

For footnotes, see page 756.

## METERS SET AND IN SERVICE—Continued.

	Percent- age of services account- metered	Percentage of water delivered to mains accounted for	METERS SET IN 1915									Misc. sizes
			5/8 inch	3/4 inch	1 inch	1 1/4-1 1/2 in.	2 inch	3 inch	4 inch	6 inch		
Texas:												
Austin .....	100	....	412 <sup>2</sup>	....	....	....	....	....	....	....	....	....
Corsicana .....	20	20	....	....	....	....	....	....	....	....	....	....
Crockett .....	80	75	....	50	....	....	....	....	....	....	....	....
Dublin .....	90	80	125	....	....	....	....	....	....	....	....	....
Longview .....	85	57	30	....	2	2	....	....	....	....	....	....
Plainview .....	50	70	50	....	....	....	....	....	....	....	....	....
Temple .....	100	75	....	....	....	....	....	....	....	....	....	....
Vernon .....	50	50	35	....	....	....	....	....	....	....	....	....
Waxahachie .....	100	....	23	....	....	....	1	....	....	....	....	....
Utah:												
Salt Lake City .....	12.3	24.5	1996	324	339	67	89	12	24	8	....	....
Vermont:												
Barre .....	30.5	....	89	6	1	....	....	....	....	....	....	....
Bennington .....	....	....	....	....	2	....	2	....	....	....	....	....
Burlington .....	89.66	73.4	78 <sup>2</sup>	....	....	....	....	....	....	....	....	....
Northfield .....	70 <sup>2</sup>	....	....	....	....	....	....	....	....	....	....	....
Richford .....	few	No data	....	....	....	....	1	....	....	....	....	....
Waterbury .....	3	15	4	2	6	....	....	....	....	....	....	....
Virginia:												
Harrisonburg .....	10	20	....	....	....	....	....	....	....	....	....	....
Marion .....	2 meters	very little	....	1	....	....	1	....	....	....	....	....
Martinsville .....	60	75	25	....	4	....	....	....	....	....	....	....
Pulaski .....	4	....	....	....	....	....	....	....	....	....	....	....
Washington:												
Bellingham .....	25	....	417	10	9	1	4	2	1	....	....	....
Chehalis .....	7	0.08	52	....	....	....	....	....	....	....	....	....
Dayton .....	40	....	223	....	1	....	....	....	....	....	....	....
Hoquiam .....	25	60	74	....	....	2	....	....	....	....	....	....
Port Townsend .....	4	....	....	....	2	1	....	....	....	....	....	....
Pullman .....	100	....	39 <sup>2</sup>	....	1	....	....	....	....	....	....	....
Snohomish .....	5	No data	....	....	....	....	....	....	....	....	....	....
Spokane .....	67	....	1335	7	11	10	16	1	....	....	....	....
Tacoma .....	10	No data	23	17	....	3	1	1	2	1	....	....
Tekoa .....	100	95	75	....	....	....	....	....	....	....	....	....
Walla Walla .....	15	....	72 <sup>2</sup>	....	....	....	....	....	....	....	....	....
Winlock .....	25	50	18	....	....	....	....	....	....	....	....	....
West Virginia:												
Clarksburg .....	54 meters	....	....	....	....	....	....	....	....	....	....	....
Mannington .....	98	70	148	....	12	....	....	....	....	....	....	....
Martinsburg .....	5	25	19	1	2	....	1	....	1	....	....	....
Moundsville .....	25	....	50	....	....	....	....	....	....	....	....	....
Sistersville .....	2	15	....	....	....	....	....	....	....	....	....	....
Wisconsin:												
Antigo .....	1	10	....	....	....	....	....	....	....	....	....	....
Baraboo .....	60	....	30	....	....	....	....	....	....	....	....	....
Columbus .....	100	100	50	....	....	....	....	....	....	....	....	....
Eau Claire .....	70.5	No data	2090	108	23	11	9	3	2	....	....	....
Grand Rapids .....	75	....	....	....	....	....	....	....	....	....	....	....
Green Bay .....	100	....	146	....	4	....	1	....	1	....	....	....
Janesville .....	40	....	1080	23	15	3	5	2	1	....	....	....
Jefferson .....	100	100	....	....	....	....	....	....	....	....	....	....
La Crosse .....	70	70	400 <sup>2</sup>	....	....	....	....	....	....	....	....	....
Kaukauna .....	35	100	....	....	....	....	....	....	....	....	....	....
Lake Geneva .....	98	75	26	1	....	....	....	....	....	....	....	....
Lancaster .....	7	....	3	....	....	....	....	....	....	....	....	....
Madison .....	99.4	70	300	25	10	2	....	....	1	....	....	....
Marshfield .....	95	80	100	....	3	2	2	....	....	....	....	....
Milwaukee .....	99	70.98	1092	590	37	28	36	26	10	....	1 <sup>0</sup>	....
Mineral Point .....	100	90	5	12	....	2	1	....	....	....	....	....
New London .....	70	....	65	....	....	....	....	....	1	....	....	....
Port Washington .....	100	....	25	....	....	....	1	....	....	....	....	....
Richland Center .....	50	25	....	....	....	....	....	....	....	....	....	....
Shawano .....	100	No data	16	....	1	1	....	....	....	....	....	....
Sparta .....	100	78	40	2	2	....	2	....	1	....	....	....
Two Rivers .....	100	all	120	....	....	....	....	....	....	....	....	....
Watertown .....	99.7	67	66	1	1	....	1	....	1	....	....	....
Waupaca .....	20	10	9	....	....	....	....	....	....	....	....	....
West Bend .....	100	75	50	....	....	....	....	....	....	....	....	....
Wyoming:												
Cheyenne .....	1	1	....	....	....	....	....	....	....	....	....	....
Canada:												
Toronto .....	3	22.3	....	....	....	....	....	....	....	....	....	....

<sup>1</sup>—10-inch meter; <sup>2</sup>—all sizes; <sup>3</sup>—part 3/4", part 5/8"; <sup>4</sup>—no domestic meters, all on large consumers; <sup>5</sup>—all but city services; <sup>6</sup>—8-inch meter; <sup>7</sup>—20 per cent of receipts are from metered services; <sup>8</sup>—of high pressure services; <sup>9</sup>—12-inch meter.

## WATER CONSUMPTION IN DETROIT.

The amount of water pumped by the Water Department of the city of Detroit, Mich., is all measured through Venturi meters, which give an average of 3% less than the figures derived from the plunger displacement. The total pumpage for the year ending June 30th, 1915, was 9.4 greater than for the previous year, as compared with a 14 per cent increase in population during the same period. Even so, however, the average daily consumption was 162 gallons per capita. But of this, 56 gallons was industrial consumption (manufacturing, railroads, hotels, etc.), leaving 106 gallons to cover domestic consumption, sprinkling and flushing streets, fire protection, leakage and waste. Forty-four per cent of the total consumption was furnished through meters.

The maximum consumption for a single hour was 50 per cent above the average daily rate, and the minimum

hourly consumption was 57 per cent of the average. The water used by the Fire Department was .04 per cent of the total consumption.

The average actual station duty of all pumps was 95,923,000 foot-pounds per 100 lbs. of coal burned, with all coal used for heating surrounding buildings charged against the engines. The cost of pumping per million gallons raised 100 feet was: Fuel, \$1.09; labor, \$1.25; oil and supplies, \$.05; miscellaneous, \$.14; total, \$2.52. The average head pumped against was 124 pounds.

The water rate is given as 90 cents for the first 2,000 cubic feet, 44.88 cents per thousand for the second, 2,000 cubic feet per quarter and 22.44 cents for all additional. These figures look like trouble for the clerks in the department, but as 7.48 (the number of gallons in a cubic foot) goes into 44.88 just six times, it is to be supposed that the meters register in gallons, and the rate is six cents per thousand gallons.



## METER RATES.

	Rate cents	Maximum— Per	Rate cents	Minimum— Per	Fixed Charge
<b>Alabama:</b>					
Anniston .....	20	100 cu ft	4	100 cu ft	None
Dothan .....	25	1,000 gals	10	1,000 gals	\$1.00 <sup>a</sup>
Gadsden .....	25	100 cu ft	4	100 cu ft	None
Jacksonville .....	10	1,000 gals	8	1,000 gals	None
Mobile .....	15	1,000 gals	5	1,000 gals	None
Selma .....	\$3.00	per quarter	10	1,000 gals	None
Talledega .....	25	1,000 gals	4.50	per 18,000 gals	None
Union Springs .....	1.00	400 cu ft	20	100 cu ft	....
<b>Arizona:</b>					
Douglas .....	25	1,000 gals	10	1,000 gals	\$1.50
<b>Arkansas:</b>					
El Dorado .....	50	1,000 gals	10	1,000 gals	1.00
Fordyce .....	50 <sup>1</sup>	1,000 gals	1.25	per 2,080 gals	None
Fort Smith .....	25	1,000 gals	10	1,000 gals	25 cents
Hot Springs .....	30	1,000 gals	15	1,000 gals	90 <sup>a</sup>
Jonesboro .....	27	100 cu ft	2.10	100 cu ft	\$1.00 Minimum
Monticello .....	43	1,000 gals	17½	1,000 gals	1 00
Wynne .....	40	1,000 gals	20	1,000 gals	.50 minimum
<b>California:</b>					
Glendale .....	10	100 cu ft	3	100 cu ft	1.00 minimum
Lodi .....	15	1,000 gals	15	1,000 gals	....
Oxnard .....	10	1,000 gals	5	1,000 gals	1.00 minimum
Riverside .....	8	100 cu ft	1.00	per month	None
San Diego .....	10	100 cu ft	8	100 cu ft	1.00 <sup>a</sup>
Santa Ana .....	10	100 cu ft	5	100 cu ft	None
Santa Monica .....	15	100 cu ft	10	100 cu ft	1.00 minimum
Santa Rosa .....	25	1,000 gals	15	1,000 gals	....
Stockton .....	25	1,000 gals	10	1,000 gals	1.00 <sup>a</sup>
Whittier .....	4	100 cu ft	3	100 cu ft	1.00 minimum
<b>Colorado:</b>					
Colorado Springs .....	15	1,000 gals	8	1,000 gals	1.00 <sup>a</sup>
Greeley .....	15	1,000 gals	12½	1,000 gals	1.50 per month
Montrose .....	30	1,000 gals	12½	1,000 gals	None
<b>Connecticut:</b>					
Ansonia .....	18	100 cu ft	3	100 cu ft	Proportional to meter size
Bristol .....	18	100 cu ft	5½	100 cu ft	\$2.00—\$20.00 <sup>10</sup>
Danbury .....	15	100 cu ft	5	100 cu ft	None
E. Hartford .....	30	1,000 gals	10	1,000 gals	None
Hartford .....	12	100 cu ft	6	100 cu ft	None
New Britain .....	10	100 cu ft	5½	100 cu ft	\$5.00 per year
New Haven .....	18	1,000 gals	10	1,000 gals	....
New London .....	12	100 cu ft	4½	100 cu ft	\$4.50 <sup>10</sup>
Norwalk .....	7½	....	5	....	....
Portland .....	25	1,000 gals	10	1,000 gals	\$6.00 <sup>10</sup>
Putnam .....	20	1,000 gals	10	1,000 gals	\$10 to \$20
Southington .....	25	100 cu ft	4	100 cu ft	\$10.00—\$40.00 <sup>10</sup>
Suffield .....	35	100 cu ft	20	100 cu ft	\$10.00 <sup>a</sup>
Wallingford .....	20	1,000 gals	7	1,000 gals	\$9.00 <sup>a</sup>
Watertown .....	35	1,000 gals	10	1,000 gals	None
Willimantic .....	25	1,000 gals	9	1,000 gals	....
Windsor .....	33	1,000 gals	28	1,000 gals	....
Winsted .....	9	1,000 gals	4	1,000 gals	None
<b>Florida:</b>					
Daytona .....	10	1,000 gals	1.25	per quarter	\$5.00 per year
Lake City .....	25	1,000 gals	15	1,000 gals	\$3.00 per year
Live Oak .....	33½	1,000 gals	10	1,000 gals	\$1.00 per month
Orlando .....	30	1,000 gals	10	1,000 gals	15.00 <sup>a</sup>
Palatka .....	16	1,000 gals	5	1,000 gals	.75 <sup>a</sup>
Pensacola .....	25	1,000 gals	6.00	per year	None
Plant City .....	25	1,000 gals	2.00	per quarter	None
Sarasota .....	25	1,000 gals	1.00	per month	....
Starke .....	33½	1,000 gals	10	1,000 gals	None
<b>Georgia:</b>					
Americus .....	20	1,000 gals	11½	1,000 gals	None
Athens .....	30	1,000 gals	12½	1,000 gals	....
Atlanta .....	10	1,000 gals	7	1,000 gals	None
Bainbridge .....	10	1,000 gals	10	1,000 gals	None
Commerce .....	22½	1,000 gals	7½	1,000 gals	.60 minimum
Decatur .....	16	1,000 gals	8	1,000 gals	None
Fort Valley .....	20	100 cu ft	12½	100 cu ft	\$15 fee
Griffin .....	15	1,000 gals	11	1,000 gals	Min. charge made
La Grange .....	25 <sup>2</sup>	1,000 gals	8 <sup>a</sup>	1,000 gals	....
Marietta .....	22½	1,000 gals	1.00	per month	....
Milledgeville .....	25	1,000 gals	15	1,000 gals	\$1.50 to \$6.50 <sup>10</sup>
Moultrie .....	20	1,000 gals	11	1,000 gals	.50 per month
Thomasville .....	15	1,000 gals	15	1,000 gals	None
Waynesboro .....	30	1,000 gals	20	1,000 gals	\$3.00 per year
<b>Idaho:</b>					
Sandpoint .....	20	1,000 gals	5	1,000 gals	None
Weiser .....	20	1,000 gals	10	1,000 gals	Price of meter deposited
<b>Illinois:</b>					
Decatur .....	20	1,000 gals	10	1,000 gals	\$4.00 per year min.
De Kalb .....	40	1,000 gals	10	1,000 gals	\$1.00 <sup>a</sup>
Elgin .....	19	100 cu ft	5½	100 cu ft	....
Evanston .....	12	100 cu ft	5	100 cu ft	None
Farmington .....	40	1,000 gals	20	1,000 gals	\$6.00 <sup>a</sup>
Galesburg .....	50	1,000 gals	15	100 cu ft	\$6.00 <sup>a</sup>
Harvard .....	3.75	1,000 cu ft	1.35	100 cu ft	\$3.75 min.
Joliet .....	20	100 cu ft	20	1,000 gals	\$6.00 per year
Lewiston .....	4	1,000 gals	1½	1,000 gals	\$5.00 per year <sup>a</sup>
Lincoln .....	40	1,000 gals	5	1,000 gals	.75 <sup>a</sup>
Metropolis .....	20	1,000 gals	7½	1,000 gals	None
Mt. Carmel .....	30	1,000 gals	7	1,000 gals	None
Mt. Olive .....	50	1,000 gals	5	1,000 gals	None
Mt. Vernon .....	30	1,000 gals	7	1,000 gals	....
Napierville .....	10	100 cu ft	10	100 cu ft	\$5.00 <sup>a</sup>
Normal .....	25	1,000 gals	20	1,000 gals	\$1.25 min.
Oak Park .....	18	1,000 gals	15	1,000 gals	None
St. Charles .....	30	1,000 gals	8	1,000 gals	None
Savanna .....	15	1,000 gals	6	1,000 gals	....
Streator .....	25	1,000 gals	8	1,000 gals	\$9.00 <sup>a</sup> —\$12.00 <sup>a</sup>
Watseka .....	25	1,000 gals	5.00	per year	....
<b>Indiana:</b>					
Batesville .....	30	1,000 gals	8½	1,000 gals	....
Bedford .....	60	....	40	....	....
Bluffton .....	20	1,000 gals	8	1,000 gals	\$6.00 per year
Brazil .....	18	100 cu ft	4½	100 cu ft	....
Clinton .....	30	1,000 gals	15	1,000 gals	\$6.00 <sup>a</sup>

For footnotes, see page 762.

## METER RATES—Continued.

	Rate	Maximum	Per	Rate	Minimum	Per	Fixed Charge
	cents			cents			
<b>Indiana (Continued):</b>							
Elwood	25		1,000 gals	6.00		per year	....
Evansville	10		1,000 gals	4½		1,000 gals	\$2.00 to \$30.00
Fairmount	15		1,000 gals	6		1,000 gals	None
Greenfield	15		1,000 gals	4		per year for sink	\$4.00
Huntington	20		100 cu ft	5		100 cu ft	\$1.00 meter rent
Jeffersonville	40		1,000 gals	5		1,000 gals	....
Lebanon	25		1,000 gals	5.00		per year	....
Linton	35		1,000 gals	..		....	\$12.00
Logansport	20		1,000 gals	8		1,000 gals	....
Mishawaka	9		100 cu ft	4		100 cu ft	\$5.40 per quarter
Montpelier	20		1,000 gals	10		1,000 gals	\$1.80 per year
New Castle	15		1,000 gals	6		1,000 gals	....
Peru	20		1,000 gals	10		1,000 gals	None
Plymouth	15		1,000 gals	15		1,000 gals	.20
Portland	25		100 cu ft	..		....	....
Richmond	20		1,000 gals	5½		1,000 gals	\$2.00 meter rent
Rushville	1.85		1,000 cu ft	.75		1,000 cu ft	\$1.00
Seymour	40		1,000 gals	6		1,000 gals	....
South Bend	12		1,000 gals	8		1,000 gals	.60
Terre Haute	20		1,000 gals	4½		1,000 gals	None
Vincennes	20		1,000 gals	5		1,000 gals	7
Washington	30		1,000 gals	6		1,000 gals	\$2.50 min.
West Lafayette	30		1,000 gals	15		1,000 gals	....
<b>Iowa:</b>							
Atlantic	30		1,000 gals	10		1,000 gals	\$6.00 year
Belle Plain	25		1,000 gals	9		1,000 gals	None
Boone	35		1,000 gals	1.50		per quarter	None
Burlington	25		1,000 gals	10		1,000 gals	None
Cedar Falls	30		1,000 gals	8		1,000 gals	None
Cedar Rapids	19		100 cu ft	7		100 cu ft	.10
Chariton	30		1,000 gals	10		1,000 gals	....
Charles City	30		1,000 gals	7		1,000 gals	\$1.20 to \$4.80
Cherokee	25		1,000 gals	25		1,000 gals	None
Creston	35		1,000 gals	15		1,000 gals	None
Des Moines	30		1,000 gals	10		1,000 gals	\$2.00
Dubuque	25		1,000 gals	6		1,000 gals	None
Estherville	20		1,000 gals	10		1,000 gals	None
Glenwood	..		....	1.80		per quarter	....
Harlan	20		1,000 gals	10		1,000 gals	None
Maquoketa	16½		1,000 gals	6		1,000 gals	10 per cent. meter cost
Marshalltown	40		1,000 gals	7½		1,000 gals	\$4.00
Mason City	40		1,000 gals	10		1,000 gals	\$4.00
Missouri Valley	35		1,000 gals	12½		1,000 gals	\$5.00
Mt. Pleasant	50		1,000 gals	20		1,000 gals	\$4.00
Muscatine	25		100 cu ft	8		100 cu ft	None
Osage	30		100 cu ft	8		100 cu ft	....
Osceola	50		1,000 gals	50		per month	None
Washington	40		1,000 gals	15		1,000 gals	None
Webster City	20		1,000 gals	10		1,000 gals	\$1.00
Winterset	40		....	15		....	\$6.00
<b>Kansas:</b>							
Abilene	25		100 cu ft	6½		100 cu ft	\$4.00
Caney	..		....	7½		1,000 gals	None
Clay Center	20		1,000 gals	15		1,000 gals	\$3.00 to \$6.00
Columbus	40		1,000 gals	50		per month	None
Garden City	10		1,000 gals	18		1,000 gals	None
Girard	34		1,000 gals	15		1,000 gals	\$4.00 per year
Hiawatha	40		1,000 gals	30		1,000 gals	....
Horton	50		1,000 gals	6		1,000 gals	\$6.00
Independence	23		1,000 gals	8		1,000 gals	.50
Larned	50		1,000 gals	8		1,000 gals	....
McPherson	25		1,000 gals	7½		100 cu ft	\$1.00 per year
Manhattan	15		100 cu ft	10		1,000 gals	....
Mulberry	30		1,000 gals	6		1,000 gals	None
Neodesha	20		1,000 gals	25		1,000 gals	\$10.00
Osage City	30		1,000 gals	5		1,000 gals	None
Osawatomie	30		1,000 gals	10		1,000 gals	None
Parsons	30		1,000 gals	8.8		1,000 gals	.50 min.
Pittsburg	40		1,000 gals	..		....	....
<b>Kentucky:</b>							
Hopkinsville	30		1,000 gals	12½		1,000 gals	\$6.00-\$24.00
Lexington	25		1,000 gals	10		1,000 gals	.50
Middlesborough	25		1,000 gals	4		1,000 gals	.90
Nicholasville	30		1,000 gals	12		1,000 gals	\$1.00 per year
Paris	25		1,000 gals	1.25		per month	....
Princeton	50		1,000 gals	15		1,000 gals	.50
<b>Louisiana:</b>							
Alexandria	20		1,000 gals	8		1,000 gals	None
Lafayette	15		1,000 gals	5		1,000 gals	None
Minden	..		....	1.50		per month	....
Morgan City	20		100 cu ft	6		100 cu ft	\$1.00
Natchitoches	30		1,000 gals	10		1,000 gals	Consumer owns meter
New Iberia	12		1,000 gals	6		1,000 gals	....
Ruston	25		1,000 gals	10		1,000 gals	\$1.00
<b>Maine:</b>							
Augusta	15		100 cu ft	8		100 cu ft	None
Bath	25		100 cu ft	8		100 cu ft	\$20.00
Rumford	20		100 cu ft	20		100 cu ft	None
South Paris	20		1,000 gals	9		1,000 gals	....
Waterville	25		100 cu ft	2½		100 cu ft	None
<b>Maryland:</b>							
Baltimore	25		100 cu ft	15		100 cu ft	None
Chestertown	25		....	15		....	None
Frederick	26		1,000 gals	3		1,000 gals	\$10.00
<b>Massachusetts:</b>							
Attleboro	23		1,000 gals	6		1,000 gals	\$4.00
Barre	50		1,000 gals	25		1,000 gals	\$10.00
Belmont	20		100 cu ft	15		100 cu ft	\$1.00-\$6.00
Brockton	17		100 cu ft	10		100 cu ft	\$1.00
Cherry Valley (and Rochdale)	..		....	2		per year	None
Concord	20		100 cu ft	7½		100 cu ft	....
Danvers	20		1,000 gals	6		1,000 gals	None
Easthampton	12		100 cu ft	6		100 cu ft	None
Everett	12½		100 cu ft	8		100 cu ft	\$6.00
Falmouth	25		1,000 gals	24		1,000 gals	\$10.00
Fitchburg	..		....	9		100 cu ft	\$5.00
Framingham	25		100 cu ft	5½		100 cu ft	\$6.00 per family
Haverhill	12		100 cu ft	15.00		per year	Meter rental
Lenox	25		1,000 gals	..		....	None

For footnotes, see page 762.



## METER RATES—Continued.

	Rate cents	Maximum Per	Rate cents	Minimum Per	Fixed Charge
<b>Massachusetts (continued):</b>					
Lowell	14	100 cu ft	10	100 cu ft	None
Lynn	37½	100 cu ft	10	100 cu ft	\$10.00 min.
Maynard	25	1,000 gals	6.00	24,000 gals	None
Middleboro	15	1,000 gals	15	1,000 gals	None
Natick	21	1,000 gals	10	1,000 gals	\$1.50 <sup>10</sup>
New Bedford	21	100 cu ft	10½	100 cu ft	None
Newburyport	15	1,000 gals	10	1,000 gals	None
North Adams	20	100 cu ft	8	100 cu ft	None
North Andover	60	1,000 gals	15	1,000 gals	None
North Attleboro	10	1,000 gals	6	1,000 gals	10 per cent. meter cost
Northampton	20	100 cu ft	20	100 cu ft	\$7.00 per year
Orange	30	1,000 gals	10	1,000 gals	\$10 per year
Oxford	23	100 cu ft	12	100 cu ft	None
Reading	22	100 cu ft	5	100 cu ft	None
Springfield	25	1,000 gals	9	1,000 gals	None
Taunton	22½	100 cu ft	6	100 cu ft	None
Walpole	20	100 cu ft	9	100 cu ft	None
Webster	18½	100 cu ft	18.5	100 cu ft	None
Wellesley	23½	100 cu ft	6½	100 cu ft	None
Weymouth	22	100 cu ft	4	100 cu ft	Yes
Williamstown	19	1,000 gals	10.45	per year	\$1.50-\$2.00 <sup>10</sup>
Winthrop	20	1,000 gals	10	1,000 gals	None
Worcester					
<b>Michigan:</b>					
Boyer City	15	1,000 gals	5	1,000 gals	\$1.60 <sup>4</sup>
Dowagiac	14	1,000 gals	8	1,000 gals	None
Holland	9	100 cu ft	3 6/10	100 cu ft	Consumer owns meter
Houghton	30	1,000 gals	9	1,000 gals	.42 <sup>2</sup>
Iron Mountain	30	1,000 gals	8	1,000 gals	\$4.00 <sup>3</sup>
Ishpeming	10	1,000 gals	4	1,000 gals	None
Lansing	40	1,000 gals	0.8	1,000 gals	\$5.00
Ludington	10	1,000 gals	10	1,000 gals	None
Manistiquie	35	1,000 gals	7	1,000 gals	None
Marquette	10	100 cu ft	3	100 cu ft	\$5.00 per year
Mt. Clemens	11	100 cu ft	6	100 cu ft	\$1.00 per year
Niles	14.3	100 cu ft	6.8	100 cu ft	None
Norway	20	1,000 gals	8	1,000 gals	None
Pau Pau	10	1,000 gals	8	1,000 gals	None
Red Jacket	25	1,000 gals	10 <sup>12</sup>	1,000 gals	None
Saginaw	11	1,000 gals	4	1,000 gals	None
South Haven	18	1,000 gals	7	1,000 gals	\$1.20 <sup>10</sup>
Traverse City			6.00	per year	\$1.00 <sup>4</sup>
Yale	15	100 cu ft	8	100 cu ft	\$2.40-\$6.00 <sup>10</sup>
<b>Minnesota:</b>					
Cloquet	50	1,000 gals	9	1,000 gals	None
Duluth	15	100 cu ft	8	100 cu ft	None
Fairmont	25	100 cu ft	5	100 cu ft	\$4.00 <sup>3</sup>
Lake City	24	100 cu ft	12	100 cu ft	None
Mankato	12	1,000 gals	6	1,000 gals	\$6.00 <sup>3</sup>
Minneapolis	8	1,000 gals	4.00	per year	None
Moorhead	40	100 cu ft	5	100 cu ft	.25 per month
New Ulm	40	1,000 gals	10	1,000 gals	None
Northfield	15	100 cu ft	5½	100 cu ft	\$6.00 <sup>3</sup>
Owatonna	30	1,000 gals	8	1,000 gals	\$1.40 per year
St. Paul	6	100 cu ft	6	100 cu ft	\$3.60 to \$864.00 <sup>10</sup>
So. St. Paul	20	1,000 gals	12	1,000 gals	\$3.60 <sup>3</sup>
Staples	1.00	per quarter	3¾	1,000 gals	None
Two Harbors	30	1,000 gals	10	1,000 gals	\$3.00 <sup>13</sup>
Worthington	45	1,000 gals			
<b>Mississippi:</b>					
Clarksdale	30	1,000 gals	8	1,000 gals	\$6.00 <sup>3</sup>
Gulfport	50	1,000 gals	10	1,000 gals	None
Jackson	20	100 cu ft	7	1,000 gals	None
Natchez	32	1,000 gals	12	1,000 gals	.40 <sup>3</sup>
Water Valley	33½	1,000 gals	30	1,000 gals	None
<b>Missouri:</b>					
Boonville	35	1,000 gals	8½	1,000 gals	None
Brookfield	50	1,000 gals	25	1,000 gals	None
Cape Girardeau	15.00 per month		50	per month	None
Carrollton	25	1,000 gals	11	1,000 gals	.70 per month
Carthage	25	1,000 gals	10	1,000 gals	None
Fulton	25	100 cu ft	15	100 cu ft	None
Higginsville	40	100 cu ft	25	100 cu ft	None
Macon	25	1,000 gals	8	1,000 gals	.50 <sup>3</sup>
Marshall	40	1,000 gals	10	1,000 gals	.80 <sup>3</sup>
Slater	50	1,000 gals	30	1,000 gals	.50 <sup>3</sup>
Trenton	30	100 cu ft	50	per month	None
Washington	30	1,000 gals	7	1,000 gals	None
West Plains	75	1,000 gals	12½	1,000 gals	None
<b>Montana:</b>					
Billings	25	100 cu ft	8	100 cu ft	\$1.00 <sup>3</sup>
Glendive	25	100 cu ft	10	100 cu ft	\$1.00 <sup>3</sup>
Helena	30	1,000 gals	11	1,000 gals	\$1.20 <sup>10</sup>
Kalispell	40	1,000 gals	7½	1,000 gals	None
Livingston	40	1,000 gals	10	1,000 gals	None
<b>Nebraska:</b>					
Auburn	50	1,000 gals	30	1,000 gals	\$1.00 <sup>10</sup>
Aurora	1.25	1,000 gals	15	1,000 gals	None
Columbus	20	1,000 gals	80	per month	None
Fairbury	15	100 cu ft	10	100 cu ft	None
Hastings	16	100 cu ft	9	100 cu ft	None
Holdrege	15	100 cu ft	9	100 cu ft	None
Schuyler	23¾	1,000 gals	10¾	1,000 gals	\$4.00 <sup>3</sup>
<b>New Hampshire:</b>					
Berlin	30	100 cu ft	10	100 cu ft	None
Claremont	15	100 cu ft	7½	100 cu ft	\$12.00 <sup>3</sup>
Concord	16¾	100 cu ft	3¾	100 cu ft	None
Dover	29	100 cu ft	15	100 cu ft	\$10.00
Franklin	15	100 cu ft	30	100 cu ft	None
Keene	15	100 cu ft	3	100 cu ft	\$4.00 min.
Lebanon	10	1,000 gals	13½	1,000 gals	\$1.50 per year
Milford	10	1,000 gals			None
Newport	25	1,000 gals			None

For footnotes, see page 762.

## METER RATES—Continued.

	Rate	Maximum	Per	Rate	Minimum	Per	Fixed Charge
	cents			cents			
<b>New Jersey:</b>							
Dover	22		100 cu ft	16		100 cu ft	None
Irvington	30		1,000 gals	10		1,000 gals	None
Jersey City	11½		100 cu ft	7½		100 cu ft	Consumers own meter
Milltown	25		1,000 gals	9		1,000 gals	\$10.00 <sup>9</sup>
Newton	25		1,000 gals	4		1,000 gals	\$6.00 <sup>9</sup>
Perth Amboy	13½		1,000 gals	5½		1,000 gals	
Pleasantville	\$10.00 per year						
Rahway	12½		100 cu ft	4		100 cu ft	\$2.00-\$4.00 <sup>10</sup>
Ridgewood	35		1,000 gals				\$2.00 <sup>9</sup>
South Orange	21		1,000 gals	12		1,000 gals	
Trenton	9		100 cu ft	6		100 cu ft	
Verona	30		1,000 gals	25½		1,000 gals	Meter sold to consumers
Wallington	20		100 cu ft	11		100 cu ft	\$2.50 <sup>9</sup>
West Orange	\$5.50 per year						\$10.00 <sup>5</sup>
<b>New York:</b>							
Beacon	25		100 cu ft	7½		100 cu ft	None
Binghamton	10		1,000 gals	6		1,000 gals	Consumers own meters
Brooklyn	10		100 cu ft				None
Carthage				36		100 cu ft	Consumers own meters
Corning				25		1,000 gals	None
Cortland	15		100 cu ft	3½		100 cu ft	\$5.00 <sup>9</sup>
Elmira	27		100 cu ft	5		100 cu ft	\$12.00 <sup>9</sup>
Fort Plain	17		100 cu ft	2		100 cu ft	10% of cost of meter ext
Frankfort				5.00		per year	Consumers own meters
Glens Falls	12		100 cu ft	2½		100 cu ft	
Homer	25		1,000 gals	13		1,000 gals	None
Hoosick Falls	25		1,000 gals	21		1,000 gals	
Jamestown	15		100 cu ft	1.50		per quarter	None
Johnstown	20		100 cu ft	2½		100 cu ft	None
Lancaster	30		1,000 gals	14½		1,000 gals	\$5.00 <sup>9</sup>
Little Falls	14		100 cu ft	4		100 cu ft	
Mt. Vernon	30		100 cu ft	7½		100 cu ft	\$12.00 <sup>9</sup>
Newark	20		1,000 gals	8		1,000 gals	Yes <sup>9</sup>
Ossining	15		100 cu ft	7½		100 cu ft	Consumers own meters
Oswego	25		1,000 gals	3½		1,000 gals	\$10.00 <sup>9</sup>
Peekskill	10		100 cu ft	5		100 cu ft	Yes <sup>10</sup>
Plattsburgh	10		1,000 gals	6		1,000 gals	None
Port Jervis	16		1,000 gals	5		1,000 gals	None
Poughkeepsie	15		100 cu ft	8½		100 cu ft	
Salamanca	25		1,000 gals	5		1,000 gals	None
Schenectady	5		100 cu ft	4		100 cu ft	None
Seneca Falls	20		100 cu ft	10		100 cu ft	\$12.00 <sup>9</sup>
Solvay	15		100 cu ft	9		100 cu ft	None
Tarrytown	30		100 cu ft	15		100 cu ft	
Tonawanda	2½		1,000 gals				None
Waterloo	50¼		1,000 gals	15		1,000 gals	\$8.00 <sup>9</sup>
Waverly				1.00 per month			None
Yonkers	15		100 cu ft	4.00 per year			None
<b>North Carolina:</b>							
Gastonia	25		1,000 gals	8		1,000 gals	\$8.00 <sup>9</sup>
Lenoir	20		1,000 gals	7		1,000 gals	Meter free
Morganton	20		1,000 gals	10		1,000 gals	.60 <sup>5</sup>
Oxford	30		1,000 gals	15		1,000 gals	None
Rocky Mount	10		100 cu ft	6		100 cu ft	None
Wilmington	12		100 cu ft	5		100 cu ft	None
<b>North Dakota:</b>							
Bismark	40		1,000 gals	20		1,000 gals	None
Fargo	50		1,000 gals	10		1,000 gals	\$4.80 <sup>4</sup>
Mandan	40		1,000 gals	15		1,000 gals	\$1.00 <sup>8</sup>
Wahpeton	23		1,000 gals	15		1,000 gals	None
Williston	20		1,000 gals	1.00			
<b>Ohio:</b>							
Ashland	30		100 cu ft	6½		100 cu ft	
Barberton	10		1,000 gals	10		1,000 gals	\$4.00 <sup>9</sup>
Barnesville	40		1,000 gals	6		1,000 gals	\$6.00 <sup>9</sup>
Bellefontaine	10		1,000 gals	8		1,000 gals	None
Bryan	25		1,000 gals	6		1,000 gals	\$5.00 <sup>9</sup>
Celina	17		1,000 gals	7		1,000 gals	\$5.00 <sup>9</sup>
Cleveland	4		100 cu ft	2.50 per year			
Columbus	9		100 cu ft	8		100 cu ft	
Conneaut	22½		1,000 gals	9.00 a year			
Coshocton	8		1,000 gals	5		1,000 gals	
Cuyahoga Falls	30		1,000 gals	12		1,000 gals	.50 per month
Dayton	6		100 cu ft	3		100 cu ft	\$2.00 per year
Delaware	2½		100 cu ft	7-10		100 cu ft	None
E. Cleveland	7		100 cu ft	7		100 cu ft	None
Eaton	20		1,000 gals	12½		1,000 gals	None
Gallipolis	40		1,000 gals	7		1,000 gals	None
Girard	35		1,000 gals	10		1,000 gals	\$5.25 per year
Glouster	20		1,000 gals	20		1,000 gals	None
Granville	20		1,000 gals	10		1,000 gals	None
Hamilton	12		100 cu ft	4½		100 cu ft	\$1.00 <sup>4</sup>
Huron	25		1,000 gals	10		1,000 gals	\$5.00 <sup>9</sup>
Kent	22½		100 cu ft	6		100 cu ft	
Lancaster	10		1,000 gals	5		1,000 gals	None
Logan	20		1,000 gals	10		1,000 gals	
Marietta	30		1,000 gals	6		1,000 gals	None
Marion	25		1,000 gals	6½		1,000 gals	None
Massillon	20		1,000 gals	10.00 a year			None
Medina	25		1,000 gals	10		1,000 gals	\$6.00 <sup>9</sup>
Middletown	10		100 cu ft	5		100 cu ft	\$4.00 <sup>5</sup>
Mt. Gilead	25		1,000 gals	6.00 a year			None
Mt. Vernon	10		100 cu ft	10		100 cu ft	
St. Marys	15		100 cu ft				\$6.00 <sup>4</sup>
Sandusky	9		100 cu ft	5		100 cu ft	
Shelby	25		1,000 gals	4		1,000 gals	\$10.00 <sup>9</sup>
Sidney	16½		100 cu ft	6		1,000 gals	\$4.44-\$53.32 <sup>10</sup>
Tiffin	22		1,000 gals	10		1,000 gals	
Toledo	9		1,000 gals	5		1,000 gals	\$5.40 per year
Toronto	50		1,000 gals	7		1,000 gals	½ flat rate
Troy	20		1,000 gals	7		1,000 gals	\$8.00 per year
Urbana				.50 per month			
Warren	18		100 cu ft	8		100 cu ft	None
Washington C. H.	25		1,000 gals	16		1,000 gals	None
Wauseon	25		1,000 gals	2.00 per q'ter			None
Xenia	25		1,000 gals	11½		1,000 gals	\$10.00 <sup>9</sup>

For footnotes, see page 762.

## METER RATES—Continued.

	Maximum	Per	Minimum	Per	Fixed Charge
	Rate		Rate		
	cents		cents		
<b>Oklahoma:</b>					
Chickasha	37½	1,000 gals	12	1,000 gals	\$3.00 <sup>10</sup>
Clinton	33½	1,000 gals	7	1,000 gals	None
Guthrie	25	1,000 gals	10	1,000 gals	None
Kingfisher	30	100 cu ft	15	100 cu ft	
McAlester	25	1,000 gals	10	1,000 gals	\$9.00 <sup>9</sup>
Muskogee	12½	100 cu ft	7	100 cu ft	..75 <sup>8</sup>
Stillwater	30	1,000 gals	15	1,000 gals	
<b>Oregon:</b>					
Cornwallis	15	1,000 gals	8½	1,000 gals	.5 <sup>8</sup>
Eugene	25	1,000 gals	16	1,000 gals	None
Marshfield	40	100 cu ft	6	100 cu ft	\$16.80 <sup>4</sup>
Hood River	33	1,000 gals	11	1,000 gals	\$1.00 <sup>8</sup>
Medford	35	1,000 gals	30	1,000 gals	Users own meters
The Dalles	16	1,000 gals	..	1,000 gals	None
<b>Pennsylvania:</b>					
Allentown	40	100 cu ft	3	100 cu ft	..
Aspinwall	40	1,000 gals	20	1,000 gals	None
Barnesboro	8.00	per month	2.00	per month	..
Carbondale	20	1,000 gals	6	1,000 gals	\$2.00 <sup>8</sup>
Catasauqua	25	100 cu ft	4	100 cu ft	None
Chambersburg	10	100 cu ft	2 6-10	100 cu ft	\$5.00 <sup>9</sup>
Chester	30	1,000 gals	4½	1,000 gals	.50 <sup>10</sup>
Duquesne	20	1,000 gals	15	1,000 gals	.20 min.
Emporium	50	1,000 gals	15	1,000 gals	..
Elizabethtown	31	1,000 gals	9	1,000 gals	\$5.00 <sup>9</sup>
Gettysburg	25	1,000 gals	12	1,000 gals	\$2.00 <sup>10</sup>
Greensburg (and vicinity)	54	1,000 gals	11	1,000 gals	\$3.00 per quarter
Harrisburg	4.00	per year per house	..	1,000 gals	None
Indiana	50	1,000 gals	15	1,000 gals	.25 per month
Juniata	6	1,000 gals	..	1,000 gals	..
Lancaster	25	1,000 gals	5	1,000 gals	None
Lehigh	5	100 cu ft	3-10 <sup>17</sup>	100 cu ft	..
Media	10	1,000 gals	7	1,000 gals	None
Meyersdale	30	1,000 gals	15	1,000 gals	None
Minersville	20	100 cu ft	6	100 cu ft	None
Norristown	20	100 cu ft	6	100 cu ft	..
Pittsburgh	18	1,000 gals	12	1,000 gals	Min. rate
Reading	4 <sup>18</sup>	100 cu ft	..	1,000 gals	..
Ridgway	20	1,000 gals	5	1,000 gals	None
Sayre	..	..	2.00	per q'ter	.30 per quarter
Sewickley	30	1,000 gals	12.00	per year	None
Sharpsville	1.50	3 months	20	1,000 gals	..
Shenandoah	15	1,000 gals	10	1,000 gals	..
Steelton	20	1,000 gals	12	1,000 gals	None
Susquehanna	40	1,000 gals	25	1,000 gals	\$5.00 <sup>9</sup>
West Newton	50	1,000 gals	11	1,000 gals	None
Wilkinsburg	20	100 cu ft	6	100 cu ft	\$10.00 <sup>9</sup>
<b>Rhode Island:</b>					
Bristol	40	1,000 gals	10	1,000 gals	None
E. Providence	10.00	per year charge	..	1,000 gals	..
Providence	20	1,000 gals	10	1,000 gals	.80 min.
Westerly	30	1,000 gals	10	1,000 gals	None
Woonsocket	21	100 cu ft	7	100 cu ft	\$10.00 <sup>9</sup>
<b>South Carolina:</b>					
Camden	40	1,000 gals	15	1,000 gals	.50 <sup>8</sup>
Clinton	30	1,000 gals	6	1,000 gals	None
Columbia	15	1,000 gals	8	1,000 gals	\$8.00 <sup>9</sup>
Florence	25	1,000 gals	15	1,000 gals	\$1.20 <sup>10</sup>
Orangeburg	20	100 cu ft	10	100 cu ft	None
<b>South Dakota:</b>					
Aberdeen	20	1,000 gals	6	1,000 gals	None
Brookings	25	1,000 gals	20	1,000 gals	Users own meters
Mitchell	17	100 cu ft	8	100 cu ft	\$6.50 <sup>9</sup>
Rapid City	25	100 cu ft	7½	100 cu ft	..
Watertown	26	1,000 gals	..	1,000 gals	Users own meters
<b>Tennessee:</b>					
Clarksville	30	1,000 gals	7	1,000 gals	\$9.00 <sup>9</sup>
Dyersburg	10	1,000 gals	10	1,000 gals	None
Franklin	30	1,000 gals	10	1,000 gals	.60 min.
Greenville	2.00	month	1.00	month	None
Humboldt	15	1,000 gals	6	1,000 gals	\$7.20 to \$66.00 <sup>10</sup>
Johnson City	17	1,000 gals	4	1,000 gals	None
Memphis	24	1,000 gals	10	1,000 gals	None
Murfreesboro	40	1,000 gals	15	1,000 gals	\$3.00 <sup>10</sup>
Paris	15	1,000 gals	9	1,000 gals	\$1.00 <sup>8</sup>
Tullahoma	25	1,000 gals	15	1,000 gals	..
<b>Texas:</b>					
Austin	20	1,000 gals	½	1,000 gals	..
Corsicana	40	1,000 gals	20	1,000 gals	\$1.00-\$1.50
Crockett	41½	1,000 gals	25	1,000 gals	None
Dublin	50	1,000 gals	25	1,000 gals	.25 per month
Longview	35	1,000 gals	10	1,000 gals	None
Plainview	15	1,000 gals	10	1,000 gals	..
Temple	41½	1,000 gals	25	1,000 gals	..
Vernon	25	1,000 gals	15	1,000 gals	..
Waxahachie	50	1,000 gals	10	1,000 gals	None
<b>Vermont:</b>					
Barre	20	100 cu ft	3	100 cu ft	\$8.00 min.
Bennington	30	1,000 gals	12½	1,000 gals	..
Burlington	15	100 cu ft	6	100 cu ft	None
Newport	20	1,000 gals	10	1,000 gals	..
Northfield	25	100 cu ft	23½	100 cu ft	\$1.00 <sup>10</sup>
Richford	20	100 cu ft	5	100 cu ft	None
Waterbury	7½	1,000 gals	..	1,000 gals	None
<b>Virginia:</b>					
Harrisonburg	12	1,000 gals	4	1,000 gals	None
Marion	8	1,000 gals	8	1,000 gals	None
Martinsville	15	1,000 gals	3.00	quarter	..
Pulaski	10	1,000 gals	5	1,000 gals	\$2.50
<b>Washington:</b>					
Bellingham	60	100 cu ft	3	100 cu ft	None
Chehalis	22½	100 cu ft	5	100 cu ft	..
Dayton	25	1,000 gals	20	1,000 gals	Users own meters
Hogiam	40	1,000 gals	6½	1,000 gals	None
Port Townsend	60	1,000 gals	14	1,000 gals	\$3.00-\$12.00 <sup>5</sup>
Pullman	33½	1,000 gals	15	100 cu ft	None
			20	1,000 gals	..

For footnotes, see page 762.



## METER RATES—Continued.

	Rate cents	Maximum Per	Rate cents	Minimum Per	Fixed Charge
<b>Washington (Continued):</b>					
Snohomish.....	10	1,000 gals	1.00 per month	1,000 gals	None
Spokane.....	10	100 cu ft	10	1,000 gals	None
Tacoma.....	33 1/2	100 cu ft	3 2-10	100 cu ft	....
Tekoa.....	20	1,000 gals	50	1,000 gals	None
Walla Walla.....	20	1,000 gals	8	1,000 gals	None
Winlock.....	22 1/2	100 cu ft	..	.....	....
<b>West Virginia:</b>					
Clarksburg.....	25	1,000 gals	5 1/2	1,000 gals	....
Mannington.....	35	1,000 gals	..	.....	\$5.00 meter deposit
Martinsburg.....	20	1,000 gals	4	1,000 gals	\$5.00 <sup>8</sup>
Moundsville.....	50	1,000 gals	10	1,000 gals	.75 <sup>8</sup>
Sistersville.....	35	1,000 gals	8	1,000 gals	None
<b>Wisconsin:</b>					
Antigo.....	8	1,000 gals	4	1,000 gals	.40 <sup>8</sup>
Baraboo.....	15	1,000 gals	12	1,000 gals	\$3.00 per year
Columbus.....	15	100 cu ft	9	100 cu ft	.25 per month
Eau Claire.....	..	.....	1.00 3 months	.....	.25 to .40 meter charge
Grand Rapids.....	15	100 cu ft	5	100 cu ft	....
Green Bay.....	22	100 cu ft	14	100 cu ft	....
Janesville.....	35	1,000 gals	5	1,000 gals	....
Jefferson.....	12	100 cu ft	8	100 cu ft	\$3.00 per year
Kaukauna.....	22 1/2	100 cu ft	7	100 cu ft	None
La Crosse.....	15	100 cu ft	4	100 cu ft	.50 <sup>8</sup>
Lake Geneva.....	35	1,000 gals	12	1,000 gals	None
Lancaster.....	30	1,000 gals	15	1,000 gals	None
Madison.....	6	100 cu ft	5	100 cu ft	....
Marshfield.....	35	1,000 gals	10	1,000 gals	None
Milwaukee.....	6	1,000 gals	6	1,000 gals	None
Mineral Point.....	35	1,000 gals	5.00 year	.....	None
New London.....	5.00 quarter	.....	1.25 quarter	.....	None
Port Washington.....	12	100 cu ft	4 1/2	100 cu ft	.50 per month
Richland Center.....	20	1,000 gals	15	1,000 gals	\$4.00 <sup>9</sup>
Shawano.....	..	.....	3 1/2	100 cu ft	....
Sparta.....	10	100 cu ft	..	.....	....
Two Rivers.....	14	100 cu ft	..	.....	....
Watertown.....	16	100 cu ft	4 1/2	100 cu ft	\$1.25-\$16.00 <sup>10</sup>
Waupaca.....	25	1,000 gals	6	1,000 gals	None
West Bend.....	12	1,000 gals	8	1,000 gals	None
<b>Wyoming:</b>					
Cheyenne.....	20	1,000 gals	15	1,000 gals	....
<b>Canada:</b>					
Toronto.....	9	1,000 gals	6 1/2	1,000 gals	None

<sup>1</sup>—60 cents outside sewer district; <sup>2</sup>—minimum 75 cents per month; <sup>3</sup>—minimum 25 cents per month; <sup>4</sup>—per year for 1/2-in. meter; <sup>5</sup>—additional service charge; <sup>6</sup>—for 3/4-in. meter; <sup>7</sup>—depends on size of meter and water rent; <sup>8</sup>—per month min.; <sup>9</sup>—per year minimum; <sup>10</sup>—water rent per year; <sup>11</sup>—0.75 cents meter rent per 1/2-in. of size, \$2.00 per year minimum; <sup>12</sup>—pond water, not fit for drinking; <sup>13</sup>—this charge for meters furnished by city; <sup>14</sup>—rental pays for meter in 8 1/2 years; <sup>15</sup>—special charge of \$1 per inch of meter size made; <sup>16</sup>—per 1,000 gals. or less; <sup>17</sup>—meters are for large consumers only; <sup>18</sup>—all water sold at 4 cents per 100 cu. ft. after payment of readiness to serve charges, which varies from 20 cents to \$3 per month for 1/2-in. to 8-in. meters.

## REFORESTING CONCORD WATERSHED.

During 1915, the Concord, N. H., water works set out 40,000 pine seedlings, procured from the State nurseries, on vacant land around Penacook Lake, the city water supply. This work was done in the spring, as soon as possible after the frost was out of the ground. The percentage of loss has been very small and the seedlings set out during the past few years have shown marked growth. The cost of planting the pines is given as \$737.84.

## WATERING HORSES IN CITIES.

The years 1914 and 1915 saw an epidemic of glanders in several sections of the Atlantic coast states, and many cities closed their existing horse drinking fountains, as it was believed that the disease was spread by the common use of bowls or troughs. Instead, drivers were asked, or required by ordinance, to carry with each horse-drawn vehicle a pail for watering horses. It remained



HORSE DRINKING FOUNTAIN, REMODELED IN 1915 TO PROVIDE FOR USE OF INDIVIDUAL DRINKING PAILS.

to provide facilities for filling these pails, and this was done in different ways.

In Boston, New Bedford and some other cities, fountains of the horse bowl type known as the H. F. Jenks pattern were adapted as follows: The bowls were removed and replaced with new castings containing three or more self-closing faucets, designed with a special view to being non-freezable. This appears to have given entire satisfaction.

## WATER METERS IN BINGHAMTON.

Metering of the services in Binghamton, N. Y., was continued during 1915, 1,864 meters having been placed, which brought the total number up to 8,453, of which 7,973 were 3/8 inch. At the end of the year 73.35 per cent of all services were metered. Concerning the effect of metering, superintendent M. Stoppard says in his annual report:

"It has always been the opinion of the people connected with the conduct and administration of the City Water Department that the only proper way to sell water was by measurement, and, also the best way to prevent unnecessary waste was to record the amount used. In this connection I append a statement of our experience during the past four years, covering the time wherein meters have been most largely installed. With a steadily increasing population, we find that both pumpage and per capita consumption decreases.

Year	Gallons pumped	Meters set	Consumption per capita.
1912 .....	2,626,201,760	416	143.09 gls.
1913 .....	2,644,924,700	1,065	136.06 gls.
1914 .....	2,450,720,640	1,843	123.02 gls.
1915 .....	2,360,615,400	1,864	115.69 gls.

"This would seem to be an emphatic and unanswerable indorsement of the wisdom of the commissioners in ordering the whole system metered."

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## CHANGE OF ADDRESS

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Contributions suitable for this paper either in the form of special articles or of letters discussing municipal matters, are invited and paid for. Subscribers desiring information concerning municipal matters are requested to call upon MUNICIPAL JOURNAL, which has unusual facilities for furnishing the same, and will do so gladly and without cost.

JUNE 1, 1916

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## Water Superintendents' Day.

The annual convention of the American Water Works Association is to be held in New York next week, papers and discussions occupying most of Tuesday, Wednesday and Thursday. Thursday from 9 A. M. to 3 P. M. (probably about four hours of actual session) is to be "superintendents' day," according to the program; the object being to devote this time to the discussion of topics proposed by members, most of them probably suggested by difficulties or questions which have arisen in their daily practice.

Those who present papers at a convention naturally select as their subjects matters of special interest to themselves, and which may or may not interest a considerable number of the other members, and only ten or a dozen papers are presented at a convention. The average member therefore may or may not hear a discussion of any of the subjects in which he happens to be specially interested and concerning which he wishes advice or information. It would add greatly to the value of this or any technical society to the average member, if he could himself bring up the subjects which he would like to hear discussed and learn what others have done or would do under conditions similar to his own. The idea of superintendents' day to provide such an opportunity is an excellent one.

The society had a superintendents' day last year, also, but we hope this year's will be different. Two or three

papers had been postponed from previous sessions, and the day began with the reading and discussion of these. Other business set a definite ending to the period devoted to this open forum, and the space left between for the superintendents' discussions was about an hour, at the end of which the initial hesitation common to such occasions had just been dissipated, and a most interesting session seemed to have begun, only to be choked off, against the protest of many.

We hope that this year no papers or other business whatsoever will be allowed to intrude on the time devoted to these discussions; and would also suggest that, at the time set for the ending, those who may wish to be allowed to continue the meeting and stay there all night if they want to. We would give this superintendents' day the right of way over everything else at the convention, for we believe that it will prove of more real interest to the majority of the members than almost any of the papers; and that if it be really developed into what it should be, it will attract to future conventions many who would not otherwise come.

## Water Meters for Large Cities.

For some reason large cities generally introduce water meters on a much smaller percentage of services than do small ones. Of the nine cities having more than a half-million population, only three meter more than 30 per cent of the consumption—Cleveland (practically all), Boston (46%) and Detroit (42%). Of the fifty-six cities of 30,000 to 50,000 population owning municipal plants, forty-five, or 80 per cent, meter more than 30 per cent of the consumption, and half meter two-thirds or more of the consumption.

From time to time efforts have been made by the water departments of Philadelphia, New York and other large cities to secure the adoption of a plan of general metering, but the people have refused to permit it. It now looks, however, as though New York City was to be extensively metered, through the action of the state legislature with the consent of the mayor. The Governor has within a few days signed a bill so amending the charter of the city as to permit the water commissioner (called the Commissioner of Water Supply, Gas and Electricity) to install meters in all places connected with the water supply, and give every property owner the right to demand a meter. The city is to own, maintain and repair the meters. It can fix an annual service charge and apply the service charge revenues to financing the meter system.

As the department recently asked for such legislation, it is to be presumed that it will proceed to take advantage of it, and that New York will soon begin installing meters by the thousand. Under the old law, meters could be required in business premises only, and thousands of multi-story apartment houses were paying absurdly low rates on the basis of foot frontage. An apartment house of 100 feet front pays \$24 per year plus \$1 for each story over one, and \$1 for each family more than one—which would be a fair rate for a private residence. The meter rate is 10 cents per 100 cubic feet.

The authority to fix a service charge, which is new also, was requested by the commission as "an essential part of every rational schedule."

New York absorbed several small municipalities in the process of becoming a "Greater" city, and a number of these were already and continue to be served by private companies which meter the supply. In 1915 Flatbush, where the rates are mostly on a frontage basis, consumed (or rather received) 120 gallons per capita per day; while Newtown, where meters are all but universal, received only about 55 gallons. This effect of meters in



reducing consumption is illustrated by a table and diagram elsewhere in this issue. That they do produce this effect in most cases cannot now be successfully denied.

The opposition to metering so often encountered from citizens to whom the idea is unfamiliar, however, is frequently based upon this very reduction; the plea being that to reduce the amount of water used is far from desirable, since it will discourage the use of sufficient water by the poorer classes, and especially by those to whom cleanliness seems least important and who therefore need most to be encouraged in it.

The most practical plan and successful argument to meet this objection would seem to be a fixed minimum payment for any amount of water not exceeding that which is ample for the necessities of an average middle class household when there is no waste. If the fixture or other rate previously charged enabled the department to meet expenses, then it should be possible to fix a minimum payment which would be less than the majority of householders were previously paying, and still allow them therefor as much water as the majority previously used; the saving resulting from cutting down waste, or the additional payment for such waste, making up for the reduction in average payments.

Another argument against metering advanced by cities with abundant gravity supplies is that the water wasted costs nothing, and the cost of meters would therefore mean an expense to the department or a curb to the consumer, with no compensating advantages. But there are only a few cities whose supply is so abundant that the time will not come when it will begin to fall short, especially during a series of dry years. If the citizens meantime have been encouraged in extravagance, it will be difficult to curb this fixed habit by metering or any form of moral suasion; while if metering (which, once adopted, is seldom opposed) has been in force, the reaching of the limit of the supply and the bond issue for a new one may be postponed for enough years to pay for the entire cost of purchasing and maintaining meters.

Even more weighty, in the last case, is the argument that increased use either demands larger mains, which means increased interest and sinking fund charges; or else the pressure will be decreased, which means reduced fire protection (and possibly a higher insurance rate because of it) and inconvenience to consumers at high points or those along the outer edges of the distribution system. Therefore, even in those few cases where a supply is obtainable by gravity so abundant as to permit all kinds of waste for generations to come, waste must be paid for in the form of either high capital charges or high insurance rates and inconveniently low pressure.

These are some of the facts which argue for metering. When the consumers can be made to appreciate them, there should be little difficulty in convincing all but the wasters that metering is to their advantage. The difficulty is to get the facts properly presented to them; and here is possibly where the small city has the advantage over the large. In a large city the number to be reached is so great, and the pamphlets and other printed matter which citizens receive is so considerable, that it is almost impracticable to reach them all by literature sent to individuals. Newspapers offer about the only recourse, and these sometimes oppose for political reasons. It is to be hoped that, with Cincinnati and New York practically all metered and three-fourths of the smaller cities at least half metered, more of the other large cities will see their advantage in following suit. Chicago, 22 per cent metered, has a consumption of 226 gallons per capita; Philadelphia, 8 per cent, 182 gallons; Pittsburgh, 15 per cent, 252 gallons; all most extravagantly high and beyond all reason, even for manufacturing cities.

### INTERMITTENT WATER SUPPLY.

New Bedford, Mass., has for a long time been supplying water to a section known as Popes Island through a 6-inch main laid in the bed of the Acushnet river. This line cost \$2,673 to instal in 1898; \$1,383 was spent in repairing leaks; and in 1903 a new line was laid to replace it at a cost of \$5,061. During the next nine years \$1,062 was spent in repairing leaks in this line. On December 14, 1915, the Federal permit for this pipe across the river was revoked, and it was removed at a cost of \$262.

The method adopted for continuing the service is thus described by R. C. P. Coggeshall, superintendent of the Water Board, in his annual report:

The placing of a new permanent flexible jointed pipe beneath the river bottom and at a depth sufficient to be well below all government requirements we found to be such an expensive proposition that when we considered the small revenue assured by this supply we decided not to proceed in this direction at present.

As a substitute we have had a temporary intermittent supply placed. This consists of a two-inch wrought iron pipe located on the south side of the bridge and crossing the draw. Detachable joints are maintained at both ends of the draw. This small pipe allows only a limited supply and it can be operated only in the night when the draw is not being used. The idea is to fill at night such tanks, cisterns or reservoirs as the users on Popes Island choose to maintain; they to apply this stored water for their daily requirements. This two-inch pipe was laid during the summer. It was first used on September 27th. Its installation cost \$490.10. This cost includes changes in the brick well in Popes Island abutment, whereby a fire engine may attach suction and obtain a salt water supply through pipe which formerly connected with the fresh water syphon pipe.

### METER MAINTENANCE.

Concerning the up-keep of meters, the water commissioners of Taunton, Mass., in their latest report say:

"The systematic cleaning, repairing and testing of meters has continued. All meters in service have been removed and taken to the shop within a period of four years. The results obtained from this system of caring for the meters has proved so satisfactory that it will be continued."

### METERS AND CONSUMPTION

#### Relation Between Consumption and Percentage Metered in One Hundred and Fifty-Five Largest Cities—Few Meters Means High Per capita Rate.

The general effect of meters is to reduce consumption, chiefly by eliminating waste. One method of demonstrating this is by comparing the per capita consumption of a given city for each of several successive years before meters were installed in any numbers and after such installing is begun. Another method is to compare the per capita consumptions in a number of cities relative to the percentage of the consumption of each city which is metered.

One of the accompanying tables gives the percentage of consumption metered and the per capita consumption in each of the 155 cities of more than 30,000 population which have municipal water systems. These figures are compiled from statistics for the year 1915 just published by the Census Bureau. Another table combines these figures, showing the number of cities which meter all their water, and the average per capita consumption per day of the group; the same for those which meter between 90% and 99%, inclusive; and so on for all the cities, grouped by ten units of "percentage of water metered."

From this table the line shown in the diagram has been plotted. This is so irregular that a curve cannot be even approximated to it; but the parabola plotted shows fairly



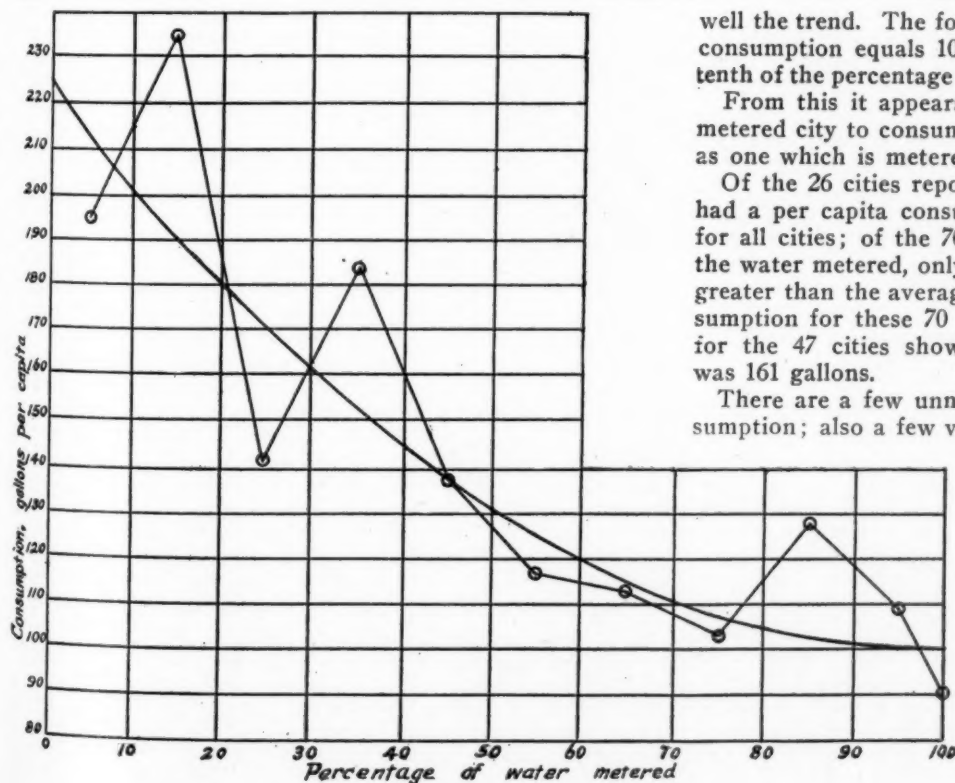
## METERAGE AND CONSUMPTION IN LARGE CITIES.

City	Percent of water metered	Per capita consumption <sup>a</sup>	City	Percent of water metered	Per capita consumption <sup>a</sup>	City	Percent of water metered	Per capita consumption <sup>a</sup>
New York	26	102	Schenectady	11	130	Hamilton	85	84
Chicago	22	226	Duluth	73	102	Perth Amboy	55	193
Philadelphia	8	182	Norfolk	80	94	Charlotte	100	63
St. Louis	30	128	Oklahoma City	98	116	Lansing	80	106
Boston	46	111	Somerville	65	74	Knoxville	47	220
Cleveland	99	118	Waterbury	50	100	Decatur	95	121
Baltimore	27	131	Akron	30	156	Everett	46	72
Pittsburgh	15	252	Troy	12	314	Joliet	90	201
Detroit	42	189	Manchester	25	64	Auburn	21	177
Buffalo	32	324	Hoboken	70	93	Pittsfield	15	152
San Francisco	7	b	Fort Wayne	100	64	Quincy	90	73
Los Angeles	80	141	Erie	36	231	Cedar Rapids	100	90
Milwaukee	72	110	Evansville	18	164	Taunton	58	65
Cincinnati	61	130	Jacksonville	95	89	Amsterdam	14	224
Newark	46	107	Harrisburg	90	111	Niagara Falls	40	253
New Orleans	100	74	Savannah	2	140	Jamestown	65	77
Washington	59	161	Bayonne	100	120	Oshkosh	38	130
Minneapolis	92	81	South Bend	33	85	Lorain	37	119
Seattle	94	160	Brockton	100	42	Jackson	100	93
Jessie City	24	149	Holyoke	29	112	Lima	80	147
Kansas City, Mo.	71	149	Sacramento	..	366	Columbia	100	141
Portland	21	141	Portland	20	130	Austin	75	122
Denver	7	b	Allentown	1	120	Waterloo	62	54
Rochester	70	106	Springfield	99	150	Aurora	75	99
Providence	70	65	Canton	35	124	Chelsea	67	90
St. Paul	61	70	Pawtucket	90	62	Waco	33	141
Louisville	45	129	Altoona	6	108	Orange	100	72
Columbus	95	92	Covington	100	46	Lynchburg	15	223
Toledo	90	118	Mobile	32	146	Colorado Springs	2	180
Atlanta	100	113	Sioux City	100	78	Newport	66	60
Birmingham	100	b	Saginaw	15	330	La Crosse	56	125
Worcester	74	75	Atlantic City	98	156	Council Bluffs	75	146
Syracuse	99	147	Rockford	100	58	Bellingham	25	162
Memphis	60	87	Binghamton	99	127	Averages	40	139
Spokane	65	246	Pueblo	7	295			
Richmond	70	105	New Britain	99	85			
Omaha	96	118	El Paso	90	69			
Fall River	57	48	Springfield, O.	48	155			
Grand Rapids	60	123	Flint	60	120			
Dayton	100	117	Lancaster	29	133			
Nashville	75	106	Augusta	9	196			
Dallas	50	115	Malden	100	46			
Lowell	56	99	San Diego	100	137			
New Bedford	96	72	Bay City	30	172			
Cambridge	33	86	Topeka	100	89			
Salt Lake City	33	203	Haverhill	27	172			
Hartford	100	64	Salem	25	89			
Trenton	22	153	Kalamazoo	100	64			
Houston	58	86	McKeesport	66	113			
Tacoma	8	430c	Lincoln	100	78			
Reading	20	139	Wheeling	6	309			
Albany	33	230	Macon	50	150			
Camden	6	127	Newton	61	70			
Youngstown	33	134	Pasadena	96	120			
Springfield, Mass.	62	103	Woonsocket	98	34			
Lynn	50	64	Montgomery	75	80			
Lawrence	93	43	Fitchburg	100	104			
Fort Worth	100	79	Galveston	99	95			
Kansas City, Kans.	52	157	East Orange	42	68			
Yonkers	100	91	Muskogee	88	92			
Wilmington, Del.	100	105	Dubuque	100	110			

## METERING WATER AND AVERAGE CONSUMPTION.

Per cent. of water metered	Number of cities	Water supplied, gallons per capita per day
100	26	85
90 to 99	23	109
80 to 89	6	128
70 to 79	13	103
60 to 69	14	113
50 to 59	13	117
40 to 49	9	138
30 to 39	15	184
20 to 29	15	142
10 to 19	8	235
0 to 9	13	195

a—average amount of water supplied to distribution system daily, divided by population served; b—not reported; c—about half this amount overflows from a low service reservoir and is allowed to run to waste.



METERAGE AND CONSUMPTION IN LARGE CITIES.

well the trend. The formula of this curve is: Per capita consumption equals 100 gallons plus  $1\frac{1}{4}$  (10 minus one-tenth of the percentage metered)?

From this it appears that the tendency is for an unmetered city to consume more than twice as much water as one which is metered.

Of the 26 cities reporting all water metered, only one had a per capita consumption greater than the average for all cities; of the 70 having more than two-thirds of the water metered, only 10 had a per capita consumption greater than the average for all cities. The average consumption for these 70 cities was 103 gallons, while that for the 47 cities showing less than one-third metered was 161 gallons.

There are a few unmetered cities with fairly low consumption; also a few very completely metered ones with

a rather high rate. But these averages of all the larger cities of the country (not a number of "hand-picked" ones) shows a most decided tendency of rates of consumption to fall as meters are introduced. The more rapid drop for the first 25 to 30 per cent of water metered apparently shows that metering persuades the large consumers to economy of water to a greater extent than it does the small ones.

## The WEEK'S NEWS

State Highway Work of New York, Michigan, Illinois and Florida—The Passaic Valley and Other New Jersey Sewerage Work—The Waterworks of Tacoma and Urbana—Street Lighting of Marion, Sheboygan and Bayonne—Municipal Lighting Plants of Columbus, Ind., and Perth Amboy—Fires in Spokane and Detroit—New Auto Apparatus.

### ROADS AND PAVEMENTS

#### New York Highway Legislation.

Albany, N. Y.—The Maier bill, making available this year \$10,000,000 from the second \$50,000,000 bond issue for highway construction and maintenance, has been signed by Governor Whitman. The governor also signed the Hewitt bill, authorizing a commission to fix new motor vehicle registration fees, with a view to requiring commercial vehicles to contribute their proportionate share for the wear and tear upon highways. Other legislation approved was the Brown bill providing that motor vehicle registration fees shall be divided equally between the state and the counties where they are collected. At present, these fees are taken over by the state for the use of the state highway department. The bill was drafted with a view to lightening the burdens of New York City taxpayers. Last year automobile registration receipts totalled \$1,913,175, of which New York City contributed \$677,399. It has been estimated that the receipts for the current year will aggregate more than \$2,500,000. Under the new law, which becomes effective immediately, the up-state counties' shares must be devoted to highway work, but Greater New York's share of the receipts is to be turned into the general city fund.

#### Decision for Good Roads.

Lansing, Mich.—State, county and township road officials of Michigan are much pleased at the recent decision of the supreme court wherein the new automobile tax law was declared constitutional. According to deputy state highway commissioner L. C. Smith, the decision places more than \$1,000,000 at the disposal of highway officials, one-half of which is credited to the state highway fund for the payment of state reward upon roads built according to state specifications. County funds are helped by the new law because one-half of the money paid in by a county in automobile taxes is returned to the county treasurer for the maintenance of county roads. Where a county is not operating under the county road system, the money is divided among the townships, villages and cities for building or maintenance of highways.

#### State Highway Work in Illinois.

Springfield, Ill.—In a forecast of the year's work, filed with Governor Dunne, the state highway commission of Illinois estimates that 472 miles of state-aid road will be constructed this year, divided as to type as follows: Brick, 11; concrete, 58; gravel, 22; waterbound macadam, 5; bituminous macadam, 6; oiled earth, 250; plain earth, 120. These figures are approximations, based on the type of road the county has selected, the amount of money available, and the estimated cost of construction. Sixteen thousand miles of roads are included in the designated state-aid routes ultimately to be improved, out of a total state mileage of 96,000. It is estimated that these routes, while but 7 per cent of the total state mileage, carry 80 per cent of the traffic. The legislature in 1913 appropriated \$1,100,000 for state-aid road work for the biennium of 1914-1915. The following session of the legislature in 1915 appropriated \$2,000,000 for the biennium of 1916-1917. These appropriations are allotted to the counties in the proportion of the road and bridge tax of the county, and must be met by like sums before they can be available to the county. At the close of the last calendar year there had been constructed some 115 miles

of state-aid roads, of which 90.4 miles are of concrete, 22.4 miles are brick, 1.2 miles are gravel, and one mile macadam. There were also 81 bridges included in the state-aid work up to this time. Total cost of this construction was \$1,497,407, which was met equally by the state and counties. Besides the state-aid road construction mentioned, the state highways department supervised the building of some 82 miles of township roads in the state in 1915. These roads were paid for by the townships by means of some special tax or by means of bonds. The state highway department assumed supervision of construction; loaned to the township the road machinery owned by the state, and sometimes sent a man to operate some of the machinery furnished. In many cases, stone for some of these roads was furnished free to the township from the quarries of the two state penitentiaries.

This year a good many of the counties will use their state-aid allotments for the purpose of constructing oiled earth roads. The state highway commission, while it does not recommend an oiled earth road for heavy traffic, has consented to the use of the state-aid money for the purpose of oiling roads where the travel is comparatively light, provided that the road is properly graded and drained. In all earth-road construction, whether oil is used or not, the road surface will be so graded and drained that any type of wearing surface may be placed thereon without additional expenditure for grading or draining.

#### Damages in Raising Grades.

Pittsburgh, Pa.—Pittsburgh will save more than \$150,000 in tenant cases which grew out of raising the grade of Penn avenue, as the result of an opinion handed down in the Supreme Court by Justice Von Moschzisker of Philadelphia. The justice ruled that "loss of profits" must be excluded as an element in fixing damages. The tenant cases were first heard before viewers, and in the 100 cases which were before them, damages amounting to over \$150,000 were awarded against the city. Exceptions were taken in all the cases by assistant city solicitor H. N. Irons.

#### Florida State Highway Department.

Tallahassee, Fla.—The new state highway department has organized itself, and William F. Cocke, the newly-appointed state road commissioner and engineer, has entered upon the duties of his office. Mr. Cocke was former division engineer of the Virginia state highway commission. J. P. Clarkson, chief clerk, has been in charge of the office in Tallahassee since the organization of the department. Although the state road department was organized last October, its real work has been delayed on account of litigation caused by many of the counties failing to remit the 15 per cent of the automobile license tax which the law provided should be paid by the counties to the state treasurer for the maintenance of the road department. Suit was brought and the supreme court of the state sustained the validity of the law in every particular. The boards of county commissioners and tax collectors of the various counties were notified by the attorney general of the court's decision and the department will now have sufficient funds to carry on its work. Pending the appointment of a state road commissioner, Mr. Clarkson, who was designated as chief clerk and assistant to the secretary of the department, has been engaged in collecting data from the various counties concerning road construction, maintenance, road and bridge funds, bond issues for roads, etc. He is the collaborator for



Florida of the United States Office of Public Roads and has recently forwarded to the road department of the government a report for 1914. The report shows the total miles of Florida roads in 1914 to have been 17,843. Of these, 6,827 were improved, and of the balance, 10,971 miles, unimproved. Of the total mileage of improved roads, the total that had been hard surfaced was 3,216 miles, and the total mileage of roads that had been graded and drained, but not surfaced, was 3,655 miles. The surfaced roads were divided as follows: Paved with vitrified brick, 256; macadam, plain, 464; macadam, mixed with bitumen, 41; concrete, 12; gravel, 42; shell, 468; rock, 126; coquina and marl, 69; sand and oil, surface treatment, 80; clay, crowned with oil, 8; sand-asphalt, 34; clay and rock mixed, 11; tarvia, on shell base, 2; marl, 52; sand-clay, mixed, 1,551. The total amount of money expended on the public roads during 1914, according to the state comptroller's report, by the various counties (exclusive of bond issues) was \$1,781,860. The total amount of bond issues reported amounted to \$7,562,500 for roads and bridges during and prior to 1914. While the figures are not available, it is estimated that during 1915 and up to the present time in 1916 a total of not less than \$8,000,000 of road and bridge bonds has been issued by the various counties of the state. The state department will have about \$17,000 on which to operate this year.

## SEWERAGE AND SANITATION

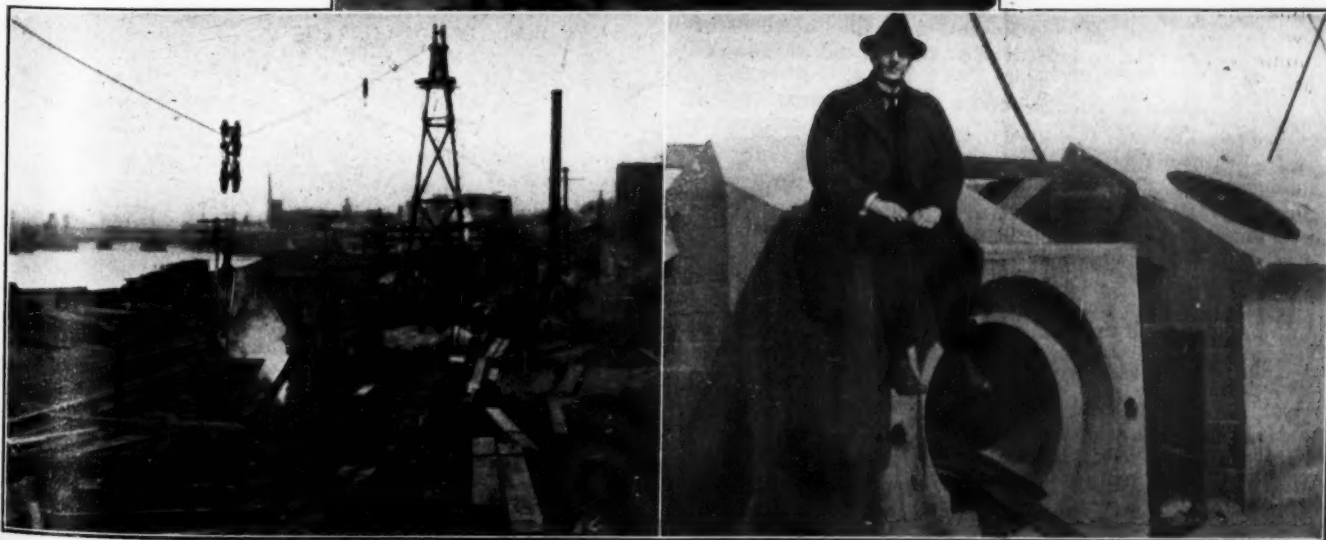
### City Plans New Sewerage System.

Dover, N. J.—Being convinced that Jersey City has repudiated the tentative agreement entered into more than three years ago and ratified at several subsequent meetings between the officials of Dover and that city, the board of sewerage commissioners has decided to take the initiative in the matter and construct sewers and a disposal plant, bonding the town in the sum of several hundred thousand dollars for funds with which to carry on the work. An engineer employed by the commissioners has completed mapping the town and locating the proposed disposal plant, which plans will be sent to the state board of health for approval. As soon as the approval is secured the commissioners will apply for a bond issue. The commissioners have obtained an option on a parcel of land for a site

for the proposed plant. The effluent from 2,000 or more residences, and from numerous store buildings, will be carried direct to a point where it will eventually find its way into the river. The present filtration plant at Boonton, operated by Jersey City, has been condemned by the state authorities as being inadequate, and the city ordered to build a larger and more efficient plant at a cost of \$1,250,000 to take care of the pollution finding its way, naturally, to the river.

### Progress on Passaic Valley Sewer.

Newark, N. J.—The Passaic Valley Sewerage Commission has completed inspection of the \$12,000,000 work of which it has charge, a party consisting of Bernard W. Terlinde, president; commissioners James G. Blauvelt, J. Frank Van Noort, John J. Berry, secretary Joseph H. Quigg, John F. Sinnott, chief engineer William M. Brown, assistant engineer William Gavin Taylor and division engineer J. Ralph Van Dwyne, making a tour of the work already finished. Many of the individual sections were nearing completion and the commission found progress very gratifying, considering the innumerable difficulties met by the contractors. Above the Newark meadows only one important stretch remains to be installed. This is the upper part of section 8, lying between Mt. Pleasant Cemetery and the Passaic River. Proximity to the river and the high embankment of the cemetery was a source of trouble to the contractors. Quicksand was encountered in great quantity, making what chief engineer William M. Brown, of the commission, called "the worst conditions possible." Reassigned twice, this contract is being fulfilled by Mason & Hangar. Because of the quicksand it has been necessary to fill the bottom of the trench with gravel and concrete flooring. On this is built the sewer passage. About 300 feet remain to be constructed. Second River crossing work probably will be completed August 1 by the contractors, the Cauldwell-Wingate Company. Three times Second River was flooded, swamping the excavations, and at all times pumps have had to work at top speed to keep the pit bottoms clear. On the north side of the stream, near the Passaic River, are the sand catchers and a section of tunnel dips under the stream in siphon form and ascends south to the stream into a chamber, already completed, where the flow is to be measured as the sewage enters Newark. At Packard's wharf in Bayonne the inspection party saw the heavy concrete



Courtesy, Newark (N. J.), Evening News.

SCENES OF WORK ON THE PASSAIC VALLEY SEWER.



pipes which are being floated out to Robbins Reef Light, more than a mile away, by the contractor, John C. Tierney, and sunk in trenches on the bottom of New York Bay. About 3,000 feet of eight-foot pipe will run east from the terminal chamber at the reef where the sewer proper ends. At the end of this pipe smaller pipes will branch out over a space of three acres and a half. There are diffusion ducts in the tops of the smaller pipes, each one of which is to have a concrete block at the end in which is a hole just large enough to admit a diver, in case repairs are needed. The contract price of this piping per foot is about \$85, in place. Piping is towed to the work ground in sections fifty feet long. Each section weighs sixty-five tons. A caisson takes up about fifty tons of the weight and the remainder is supported by derricks on the lighter. More than half of the piping, or about 2,500 feet, is laid, and work, suspended during the winter, has just recommenced.

July 1 will see completion of the tunnel from the Newark meadow shore under Newark Bay to Bayonne, according to contract agreement between the commission and John F. Shanley, Jr., contractor. This tunnel was carried under the bay at a depth of about 250 feet. All present work is being done with the shaft heading on the Bayonne shore as a base, though actual operations are under the bay near the Newark shore, more than a mile distant. Concrete is mixed on the shore side and all materials are carried through the tunnel in electrically operated dumping cars. A few hundred feet of concrete casing is to be put in place in the tunnel, which is twelve and one-half feet high, and the shaft on the Bayonne side is to be concreted. The party viewed the work on the pumping station on the meadows. Completed, the plant will represent an expenditure of about \$720,000. P. J. Moranti, Inc., set the foundation, nearly sixty feet deep, in what was formerly mosquito-breeding marsh land, and a solid road leading several hundred feet to the proposed building and all around it has been built. The Essex Construction Company is taking up the work where the Moranti concern left off, and already has in place a large part of the steel frame on which will be placed the brick and terra cotta shell. The Camden Iron Works will install the power plant on foundations already completed. The main building is a large structure. The engine house will be 170 by 75 feet; the screen house and administration building each 75 by 45 feet; the boiler room 125 by 45 feet. Separate from the main building is the grit chamber, already completed. A large concrete trestle at the south of the building indicates a modern system of coal handling. Freight cars will be run over this trestle and will dump coal at the very doors of the boilers. Under the building proper, extending down through the meadow into hard pan, are the pump pits and passages for the fluid which will be handled by the pumps and discharged into the outfall tunnel, to flow under Newark Bay, the Bayonne peninsular and into New York Bay. The accompanying illustrations show the excavation near the Passaic river; two of the "manhole" blocks and a section of the outfall piping, with vents, to be placed at the bottom of New York Bay.

#### State Aid in Sewerage Improvements.

Austin, Tex.—The sanitary engineering division of the state health department, in charge of V. E. Ehlers, has inaugurated a plan to assist Texas cities and towns in the planning and construction of sewerage system. The plan provides for the standardization of sewage disposal plants. Every city planning a sewer system is urged to forward plans to the state department for approval of the sanitary engineer. These plans must outline not only the sewer to be constructed but the grading of all streets where future growth of the city might necessitate additional sewers.

#### Sewage Disposal Case Postponed.

Middlesex, N. J.—With the case of the complainants only partly presented, the suit to enjoin the construction and operation of a sewage disposal plant in the borough of Middlesex, to serve Plainfield and the boroughs of North Plainfield and Dunellen, has been put off until December 6 by vice chancellor Howell. The vice chancellor had al-

lotted three days to the case, but it soon became manifest that the trial would last much longer. The complainants, who challenge the right of the three municipalities to use a Middlesex site, are owners of the Sebring farm adjoining the Darling farm of ninety acres, acquired for the disposal plant. Besides the three municipalities named, the bill names the Cauldwell-Wingate Company, the Atlantic Construction Company and Edward L. Bader as co-defendants. The plan adopted by the defendant municipalities provides for the discharge of the effluent into Green Brook, at a point on the Sebring farms through which it will be carried in a conduit to the place of discharge. The bill sets out that the complainants' stock drink from this stream and that the discharge of the treated sewage into it will work permanent and irreparable damage. Using Charles J. Merrill, chief clerk of the state department of health, as a witness, the plaintiffs contended that the state department of health had no authority to pass on the question of location. Cornelius C. Verneule, of East Orange, testified that floods would interfere with the operation of the disposal plant and that the high water would wash out sludge from the sludge beds, with the result that the foul matter would be deposited on complainants' lands below.

## WATER SUPPLY

### Tacoma's Water Plant.

Tacoma, Wash.—Tacoma's municipally owned water system is valued at \$4,746,877.31. After a year's work by members of the department, superintendent P. S. Savidge has filed with council the first appraisal and inventory. The report lists all property, together with reproduction cost and depreciation. The cost of compiling the report was about \$1,100. Sixty pages of maps show the location of all sub-stations, reservoirs, land, engines and machinery. Every tap, valve, gate box and every foot of pipe is listed. The principal item of the plant is the Green river gravity system, the value of which is given as \$2,317,653. Stand-pipes and reservoirs are worth \$136,339.34; pumping stations, \$149,883.30; distributing system, including all water mains, gates, valves, etc., \$1,787,947.77. Real estate, including reservoir and pump station sites, right-of-way for pipe lines, etc., \$100,050. The cost of reproducing the entire system is given as \$5,557,486.70, \$810,609.39 of which is estimated as the amount of depreciation. During the two years ended January 1, 1916, according to commissioner Drake, there was a net profit in the water department of \$85,372.24 in 1914 and \$118,778.78 in 1915, a total of \$198,151.02. The light department for the two years showed a net profit of \$598,446.44. The total for the two departments was \$796,595.35.

### Rate Schedule Approved.

Irvington, N. Y.—After showing, through the testimony of Frank C. Kimball, general manager of the Commonwealth Water Company, that the burden of such increases as are made to Irvington patrons by the proposed new water rate schedule would be borne by sixteen patrons, Carroll P. Bassett offered before the Public Utility Commission an amendment to the schedule to correct this inequality. The result will be a large proportion of reductions among consumers in that town. Mr. Kimball, the only witness, was examined by Mr. Bassett. Harry J. Stanley, chairman of the special water committee of the town; corporation counsel W. Eugene Turton and Alexander Potter, a New York engineer, represented Irvington. Mr. Kimball's figures showed that the 2,897 consumers in Irvington paid on the old schedule about \$14,840 a quarter. On the proposed schedule they would pay about \$15,180. Leaving out the sixteen highest consumers, the quarterly income would be \$13,670 under the old schedule; under the new it would be \$13,350. The new schedule represented an increase to the sixteen of about \$565, whereas the lump increase to all was only about \$250. Mr. Bassett's amendment remedies this by giving a reduction on the proposed schedule of from fourteen cents to twelve cents for consumers using more than 5,000 cubic feet, up to 35,000, above which point there is to be a reduction

from ten cents to nine. An increase is proposed likewise in the amounts of water to be used under the minimum clause. That the bulk of consumers would pay less by the new schedule was contended by Mr. Bassett, as at previous hearings. The company manager showed that rates were increased for 794 consumers, remained unchanged for 436 and were decreased for 1,667.

#### Report on Urbana's Waterworks.

Urbana, O.—The report of the examination of the Urbana waterworks from October 1, 1914, until January 31, 1916, recently made by E. F. McGuire, state examiner, has just been received by superintendent Link Burnham. The report is very gratifying and shows the municipal plant is on a paying basis. It covers a period during which three service directors were in charge of affairs—Joseph W. Flaughner, the late John W. Rock and the present official, Harry E. Rock. The total number of water rental accounts on the books is 1,775, of which 1,600 are on a flat rate and 175 on meters. The city is furnishing free water service for 176 fire hydrants, fire department, city building, library, 10 watering troughs, 5 drinking fountains, 38 sewer flush tanks and water for flushing the streets which, if charged for, would cost \$7,699. Notwithstanding this free service and the fact that \$2,293.66 is charged against the city as a loss of taxes that would be paid if the plant were owned by an individual or corporation, the plant last year came within \$1,605.32 of being self-sustaining. The sum of \$8,000 was turned over to the same fund within a few weeks. In addition to this, \$3,500 was paid out last year for renewing service mains where the paving has been done. The plant has been owned by the city since 1911 and the bonded indebtedness for waterworks purposes is \$141,500. "Extensive repairs have been made so that the plant now, in many respects, can be said to be almost new," is a statement made by the examiner in the report.

### STREET LIGHTING AND POWER

#### Company Fights Municipal Competition.

Columbus, Ind.—The Central Indiana Lighting Company has filed suit in the Bartholomew circuit court against the city of Columbus and the Sanborn Electric Company, of Indianapolis, for a permanent injunction to prevent the city of Columbus buying electric lighting equipment from the Indianapolis company, alleging that the city intends to engage in commercial lighting in competition with the lighting company. The city entered into a contract with the Indianapolis concern March 20 to equip a new plant here for \$15,986. The complaint alleges this contract is illegal, and also that the city does not need such expensive equipment to replace worn-out machinery for street lighting. The Central Indiana Lighting Company has a franchise that runs for twenty years.

#### Plan Improved Street Lighting.

Marion, O.—The members of the light committee of the city council, consisting of W. C. Stafford, Edward Kavanagh and H. M. Mumford, have adopted new plans for the street lighting system. At the instance of Frank Glosser, superintendent of the lighting department of the C., D. & M. Railway, Light & Power Company, a joint meeting was recently held with the committees of the council and Chamber of Commerce to formulate a plan for lighting the streets that will not only take care of the present requirements, but admit of future extensions being carried out in a uniform manner. Although the present contract for street lighting does not expire for nearly three years, new lights that are petitioned for or needed will be erected according to the new plans, which were prepared by H. A. Tinson, of Harrison, N. J., an expert illuminating engineer. A number of the present lights will be changed to conform with the plan. In his report, Mr. Tinson finds: "Up to the present no definite street lighting plan has been followed out. Several types of illuminants are used; the spacing and heights are irregular; little attention has been paid to the class of street to be illuminated, nor to the location of the units; high power lamps are installed where low power units

would suffice; lamps of low candlepower are now used where larger units are needed. No attempt is made to trim trees, so that a good deal of the light emitted by the street lamps is absorbed among the branches. The lighting units at present in use comprise 7.5-ampere enclosed carbon arc lamps; 100-candlepower mazda series lamps; standard boulevard type mantle gas lamps and five-light mazda clusters in the business districts." The layout made totally disregards the present layout and lamp equipment. On the plans lamps have been located also on the pikes, outside of the city boundary, which lead to the city. The spacings along the pikes on one plan are approximately 400 feet and 60-candlepower lamps would act as beacons along these roads and facilitate automobile driving. On an alternative plan the units are located 300 feet apart, to coincide with the general lighting plan of the rest of the city. At these locations lamps might be either 40 or 60 candlepower, to practically serve the purpose of beacon lighting. It is also recommended that ornamental units at present installed should be retained, but be improved by converting the present standard to a single light standard by taking off the five-cluster top and substituting a top equipped with a 600-candlepower mazda lamp.

#### Municipal Plant Nearing Completion.

Perth Amboy, N. J.—City electrician Jay B. Franke is now engaged in making contracts with merchants and house owners for electricity for light, heat and power to be furnished by the new municipal electric plant. Following an inspection of the plant by the city electrician and alderman F. William Hilker it was announced that it would probably be ready to furnish street lighting on August 1 and to furnish current for commercial use by September 1. The plant is practically complete and work upon the underground system is being rushed toward completion. The Watson-Flagg Engineering Company and its sub-contractors have large forces of employees at work. The plant is equipped with two Bollinger oil engines of the latest type, each connected to a powerful generator, making two complete units, giving a total of 800 horsepower. There is over thirty feet of switchboard in the station and all appliances, electrical and otherwise, are of the latest approved types. The plant is so equipped that it will always be in operation. Automatic control will be placed over all lines. The municipal plant rates will be five cents a kilowatt hour for power service and seven cents a kilowatt hour for ordinary lighting service.

#### Celebrate White Way.

Sheboygan, Wis.—Sheboygan's new ornamental lighting system on North Eighth street, from Jefferson to Michigan avenue, has been formally dedicated with fitting ceremonies before "the greatest throng that ever assembled in this city." Parades of civic, commercial and fraternal organizations, bands, red fire and speeches marked the celebration. Alderman Herbert Jung, chairman of the street lighting committee of the common council, threw the switch and the 112 new lights were turned on. The installation of the new system cost \$7,500 and the money was contributed by the merchants of North Eighth street and a few manufacturers, members of the Association of Commerce. The standards each hold a 400-candlepower mazda lamp within a frosted globe. All lights were burned all night after opening, but after that all will burn until midnight and then will be turned off, except the light on the southwest corner of every street intersection, which will be burned until dawn, thus giving more light in each block after midnight than under the old system.

#### Proposed Lighting System for Bayonne.

Bayonne, N. J.—The city commissioners have received a report from city engineer Walter L. Clarkson showing the estimated cost of the proposed electric conduit system for the city. The cost of completely equipping the city with conduits is calculated to be \$400,000, providing for eight ducts through the longitudinal streets; six-duct conduits through the principal side streets, and four-duct conduits through the less important streets. Clarkson also submitted an estimate for a cheaper system, which would cost but



\$250,000. This latter plan provides for the installation of eight ducts through the longitudinal streets and through Twenty-second street. The plan to install city-owned conduits in the streets of Bayonne is sponsored by commissioner Matthew T. Cronin. In explanation of the report of the city engineer, commissioner Cronin stated the Public Service Electric Company is holding up the installation of the Broadway "white way," in an effort to make the city commissioners sign a five-year contract with the company.

## FIRE AND POLICE

### Firemen Overcome in Drug Blaze.

Spokane, Wash.—Fire from an adjoining storeroom reaching the basement of the Murgittroyd drug store caused a very difficult fire in which about forty firemen were overcome by drug and chemical fumes. The total damage was \$119,500, most of the block being destroyed. Nobody was killed or injured although about fifty people were caught in the stifling smoke of the burning buildings. There were many exciting rescues, men and women being lowered from the roof by ropes.

### Film Fire in Detroit.

Detroit, Mich.—Following an explosion in the cleaning room of the Universal Film Company, the fire spread rapidly through the dangerous materials throughout the whole building and endangered the lives of forty employees and did a total damage of over \$100,000. The celluloid and chemicals made the fire almost impossible to fight and when the firemen arrived the building was a mass of flames surrounded by dense fumes. Nobody was severely injured although there were a number of thrilling rescues. The accompanying illustration shows a view of the firemen at work on the blaze.

### Record Low Fire Loss.

New York, N. Y.—In his annual report to Mayor Mitchell fire commissioner Robert Adamson states that in 1915 the fire loss in New York was the lowest per capita in the history of the city. The average loss for each fire was also the lowest. Commissioner Adamson further points to the fact that the 1916 budget for his department had been decreased from the amounts appropriated in 1914 and 1915. The report also showed that in 1915 the department turned back to the city buildings and sites worth \$418,000, and eleven buildings leased at \$10,800 a year. The report reads:

The fire loss was lower by 32 cents per capita than in any previous year, and the total loss lower by \$2,460,793 than in 1914. We had 1,010 fewer fires and an aggregate loss of only \$5,757,018, as against \$8,217,811 the preceding year. The per capita loss was only \$1.06; the lowest previous loss was \$1.38. The loss per fire was \$429.11; the lowest previous loss—that of 1914—was \$569.69. In only two other years since consolidation, a period of eighteen years of rapidly growing population, has the total loss been beneath \$7,000,000. In short, with eight times the population, the loss was actually nearly \$1,000,000 less than in the first year after the creation of the paid Fire Department fifty years ago. Fires during the year numbered 13,416. Of these 7,951 were trivial blazes, extinguished without the aid of a fire engine. One stream extinguished 509. From any single fire the heaviest loss was \$150,000. Up to 1915 for a period of sixteen years the Fire Department budget increased at the annual rate of \$313,679—almost a million dollars every three years. In your administration twenty new fire houses have been manned and three other companies organized. For these the annual maintenance and operation charges are \$515,000 a year. Employees to meet new duties have also been added to each of our three civilian bureaus at an increased cost of \$74,412 a year. Despite this extension of service, not a dollar of additional appropriations was asked for. On the contrary, for the first time in the history of the Greater City, and, so far as I know, in the entire history of the department, the budget was reduced instead of increased. This decrease in the budget for 1915 was \$65,110 and in the budget for 1916, it amounts to \$173,050. The means by which this was accomplished were these: Cost of supplies reduced, \$294,647; vacant positions abolished, \$95,990; details of 16 officers and 63 firemen revoked; 15 fire companies discontinued and 7 captains, 20 lieutenants, 20 engineers, 157 firemen, and 4 pilots, thereby released for duty in new companies; repair shops, fuel depots, stables and storehouses consolidated. In all, only eight employees were dismissed from the department in two years.

The report attributed the decrease in fire loss to three factors: systematic extension of fire prevention; monthly inspections by firemen, and increased efficiency in the uniformed force, due to the Fire College and School of Instruction Training. Three hundred firemen made 1,500,000 in-

spections during the year and corrected 50,000 fire-producing conditions by verbal requests. More sprinklers were installed in 1915 than in any other year.

## MOTOR VEHICLES

### Buys Many Motor Vehicles.

Augusta, Ga.—The city council has purchased a number of pieces of motor apparatus for the fire and street departments. Two new Seagrave combination pumping engines and hose wagons were bought for \$17,000. One White motor sprinkling truck for \$4,225 and one 2-ton dump truck for \$3,700; one Kelly-Springfield 3-ton for \$3,490 dump truck and one 2-ton dump truck for \$2,937.50 were bought for the street department.

### Fire Truck Purchased.

Franklin, Pa.—Franklin borough council has voted to purchase an American-La France fire truck, a combination chemical and pumping machine, at a cost of about \$9,500. One thousand feet of hose will also be purchased. The Franklin fire company will share the expense of the new equipment.

### New Fire Auto in Service.

Lowell, Mass.—A report of the official tests of the new Robinson automobile triple combination has been received by Commissioner Putnam and as it is satisfactory the combination has now been put in actual service in the Central fire station. Four tests were made under the direction of representatives of the New England Insurance Exchange. All of the tests were conducted by John S. Colwell of Boston, and Charles R. Baker of New York. The report on the three tests is as follows: First test, two hours, two 50-foot lines, 2½ inch hose siamesed into a deluge set with 1¾-inch nozzle. Average discharge and pressure, 862 gallons per minute, at 124 pounds net pump pressure. Second test, one hour, three 50-foot lines, 2½-inch hose siamesed into a turret pipe with 1¾-inch nozzle. Discharge and pressure, 953 gallons, at 123 pounds net pump pressure. Third test, 30 minutes, with one 200-foot line, 2½-inch hose siamesed in turret pipe with 1¾-inch nozzle; average discharge and pressure, 528 gallons per minute, at 200 pounds net pump pressure.



Courtesy, Detroit (Mich.), Free Press.  
FILM STORAGE FIRE.



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Are backed by character and reputation, founded on quality. Every water works man using Mueller Goods speaks well of them because they are honestly built to give the most for the money. Our policy is to make only high grade goods. They speak for themselves in no uncertain tone of satisfactory service. That's what you want, Mr. Water Works Man—satisfactory service—and you will never get anything else when you use Mueller Goods.

## The Tapping Machine That Tops the List

The Mueller Tapping Machine is known throughout the world for its many points of excellence—it wears for 25 to 30 years—next to impossible to wear it out.

It will outlast anything about the plant.

The No. 2 machine illustrated here, makes taps  $\frac{3}{8}$  to 1" and inserts corporation cocks in mains under pressure—does it with absolute precision and accuracy. Does it so that you have a connection that will hold, and does it at the least expenditure of money and effort.

## Goods That Go Under the Ground

Should be of unquestioned dependableness, like Mueller Goods which are proved up under a 200 pound hydraulic pressure test. This insures them to you as fit for service. No man can afford to put under ground any goods that he is liable to have to dig up to repair or replace. It costs too much. Avoid this possibility by always using Mueller Goods.



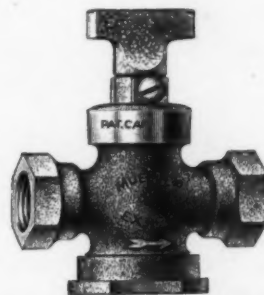
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Mueller Goosenecks, Wiped Joint or Lead Flange, from single to eight branch. Extra strong lead pipe, Mueller red brass fittings, and our 200-pound hydraulic pressure test is a guarantee of good quality.



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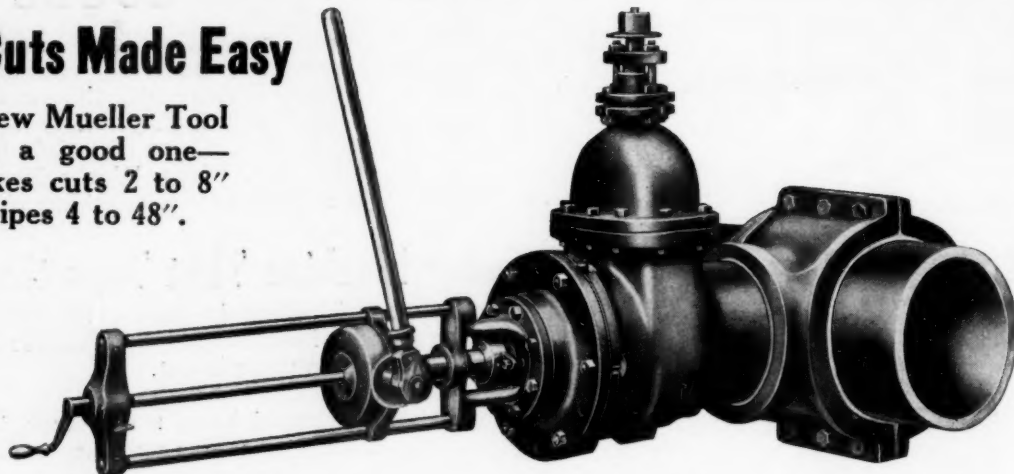
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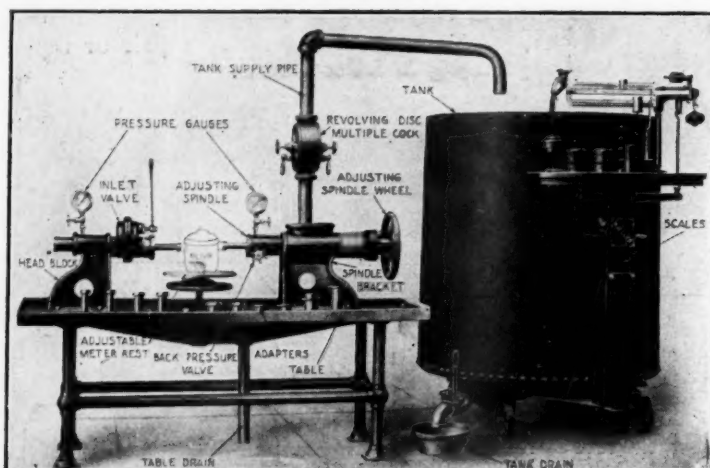
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A new Mueller Tool  
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## LEGAL NOTES

A Summary and Notes of Recent Decisions—  
Rulings of Interest to Municipalities

## Issuing Bonds—Injunction.

Town of Afton et al. v. Gill.—Where it is shown that funds derived from the sale of bonds about to be issued will be devoted to unlawful purposes, and where it is further shown that said funds may not properly be applied to the purposes for which they were voted, the issuance of the bonds will be enjoined.—Supreme Court of Oklahoma, 156 P. R., 659.

## Constructing Sidewalk—Property Owners—Permission.

Riley et al. v. Town of Trenton et al.—Property owners cannot restrain a city from constructing a sidewalk in front of their premises on property which is part of the public thoroughfare because of the unconstitutionality of the statute under which the city is proceeding, since no right of theirs is being invaded.—Court of Civil Appeals of Texas, Texarkana, 184 S. W. R., 344.

## Mechanics' Liens—Improvements by Lessee—Knowledge of Owner.

Daily v. Cremen et al.—A mechanics' lien attaches to leased property for repairs by the lessee where the materials or labor were furnished for the improvement, and the lessor had either actual or constructive knowledge that it was being made, unless the lessor gives the notice of non-responsibility provided for by L. O. L., section 7419.—Supreme Court of Oregon, 156 P. R., 797.

## Regulations of Board of Health—Validation by Ordinance—Maintenance of Slaughterhouse.

State v. Temple.—An ordinance of a city of the second class having more than 1,000 and less than 5,000 inhabitants, which gives the mayor "jurisdiction and with authority over all places and territory within the limits of said city and within five miles thereof to enforce the rules, regulations and ordinances of the board of health of said city," does not give validity to a "regulation" of the board of health which attempts to make it criminal to maintain a slaughterhouse outside of the city and to provide a punishment therefor.—Supreme Court of Nebraska, 156 N. W. R., 1063.

## Police Power—Building Regulations.

Board of Education of City of St. Louis v. City of St. Louis et al.—Under Const. art. 11, section 1, for establishing a public school system by the General Assembly, and the act of 1897 (Laws 1897, p. 220), amended by act of May 28, 1909 (Laws 1909, p. 846), providing that cities of 500,000 inhabitants shall constitute a school district and have certain corporate powers, including the care of school buildings, their ventilation, etc., a regulation of the St. Louis board of public improvements as to building ventilation does not apply to the construction of school buildings, notwithstanding the city charter.—Supreme Court of Missouri, Division No. 1, 184 S. W. R., 975.

## Regulations—Occupation of Streets—Poles and Wires.

Duquesne Light Co. v. City of Pittsburgh.—An ordinance requiring public service corporations furnishing electric light, heat, or power or operating telegraph or telephone lines to construct conduits and complete the same before the completion of improvements on certain streets and to remove overhead poles or wires and place the same underground, and providing that where the city had any of its lines on such poles the companies owning the poles should first remove their own wires and place them underground, and when that was done the city should remove its lines or wires, is not limited in its operation to poles which were used by the city for carrying its wires, but applies to all poles and overhead wires on the streets named. Where the overhead wires of defendant carry electricity of such high voltage as to be dangerous to any one coming in contact with them and they amount to an obstruction and consti-

tute a source of additional danger in fighting fires, both to the firemen and to the public, an ordinance requiring them to be removed and placed in underground conduits is within the power of the city.—Supreme Court of Pennsylvania, 97 A. R., 85.

## Injuries to Persons on Street—Liability—"Traffic."

Stewart v. Hugh Nawn Contracting Co.—Under St. 1911, c. 741, section 18, declaring that all work done under the act shall be conducted in such a manner as to leave the streets or a reasonable part open for traffic, the word "traffic," which is defined generally as the exchange of goods and commodities, includes the ordinary uses of the street by travelers.—Supreme Judicial Court of Massachusetts, Suffolk, 112 N. E. R., 218.

## Supervision of Wharves—Liability for Injuries.

Rusk v. Montgomery et al.—The mere fact that a city passed an ordinance providing for a water front committee, who should have general supervision and control of all wharves and docks within the city, to see that all laws, ordinances, and regulations governing them were enforced, etc., did not render the municipality liable for damages resulting from the negligence of the owner of a private wharf when a foot passenger broke through a board.—Supreme Court of Oregon, 156 P. R., 435.

## Acquiring Waterworks—Power of City.

Spear et al. v. City of Bremerton.—Where a municipality had authority to acquire a waterworks and dispose of excess water to any person within or without the city, a judgment holding that it was entitled to purchase the waterworks used to supply several municipalities is not a conclusive adjudication, precluding private taxpayers, upon purchase from subsequently enjoining issuance of bonds given for the purchase price, for until the terms of the purchase were agreed upon and the bonds issued the taxpayers had no grievance.—Supreme Court of Washington, 156 P. R., 825.

## Public Improvements—Assessments—Conclusiveness.

City of Vancouver v. Corporation of Catholic Bishop of Nisqually.—An assessment made by a board of eminent domain commissioners in a local improvement district is conclusive, unless the record discloses that the board has acted arbitrarily or upon a fundamentally wrong basis, the rule by which the benefits were measured having been fundamentally wrong, and so arbitrary and unjust as affecting the property owner as to evidence fraud, mistake of fact or law, or arbitrary action amounting to a manifest abuse of discretion.—Supreme Court of Washington, 156 P. R., 283.

## Contracts—Bonds—Construction—Subletting.

City of St. Louis v. McCully Construction Co. et al.—Under a contract for the reconstruction of part of a city poorhouse according to plans and specifications, and a bond entered into by the contractor in a penal sum conditioned to properly perform the contract according to its terms, and on its completion to pay to the proper parties all accounts due for material and labor, was to protect materialmen, and that it might be sued on at the instance of any materialmen in the name of the city, a materialman was a proper party to sue on the bond, notwithstanding a clause in the contract against subletting the work.—St. Louis Court of Appeals, Missouri, 184 S. W. R., 939.

## Lands Under Water—Extension of Pier—Construction of Ordinance.

American Ice Co. v. City of New York et al.—Under an ordinance of the city of New York of 1844, relating to the powers of the commissioners of the sinking funds as to the sale of public lands, etc., confirmed by Laws 1845, c. 225, providing that all grants thereof should contain the usual covenants relating to streets, bulkheads, and wharves, including a covenant to build the wharves, etc., when required by the city, a grant of a pier by metes and bounds, with the right to wharfage, not containing the usual covenants as to streets and bulkheads, did not render the grant void, but required the grantee, on the city's order to extend the pier at his own expense on penalty of forfeiture to the city,



or any other guarantee; and, while not conveying the fee, conveyed the incorporeal hereditaments of maintenance and wharfage over any extension required by lawful authority.—Court of Appeals of New York, 112 N. E. R., 171.

**Public Improvements—Recovery of Damages—Benefits.**

*Gaylord v. City of Bridgeport*.—A property owner in the rear of whose land a new highway was opened without taking any of his land was not entitled to recover as damages against the city any expenditure made necessary or probable, as for pavements, sidewalks, or street sprinkling—by the improvement.—Supreme Court of Errors of Connecticut, 96 A. R., 936.

**Pavement Contracts—Faulty Construction of Pavement—Opposing Assessment.**

*Helwig v. City of Gloversville*.—If a contract for pavement is legally awarded, a poor pavement, or a poor job in laying it, in the absence of fraud between the council and contractors, is no ground for opposing an assessment to meet its cost.—Supreme Court, Fulton County, at Chambers, 158 N. Y. S., 475.

**Control of Streets—Acquisition.**

*Duckworth v. City of Springfield*.—By the extension of its corporate limits a city acquires control over all highways formerly controlled by a county thereby included within it, since the control over such highways passes by virtue of the state law from the one political subdivision of the state to the other, accordingly as the highway is in the one or the other.—Springfield Court of Appeals, Missouri, 184 S. W. R., 476.

**Public Improvements—Assessments for Benefits—Notice—Curative Act.**

*Phipps et al. v. City of Medford*.—Though a city charter provided for notice to adjacent property owners at least ten days before commencing construction of a sewer, a sewer having been constructed without such notice an initiative amendment to the charter providing for the levy on realty for sewers after construction, was valid, and applied to such sewer, as it would have been permissible in the first place to allow construction without previous notice, and it being within legislative power by subsequent enactments, to dispense with or obviate any previous provision which might have been originally omitted.—Supreme Court of Oregon, 156 P. R., 787.

**Use of Streets—Personal Injuries—Liability.**

*City of New Orleans v. Le Blanc*.—The obligation rests upon the city of New Orleans (as upon other municipal corporations) to keep its streets in a safe condition, and, if a person sustains injury by reason of a neglected bridge, or an unguarded excavation or obstruction, in a public street, the city is liable therefor in damages; and, though the courts have not, thus far, held municipal corporations liable for injuries resulting from the use of the streets by vehicles driven by steam or electricity, the obligation rests upon them to guard the public from that danger, as well as from any other that may threaten; and particularly is that true with respect to such vehicles when engaged in business as common carriers, a business affected with a public interest, and therefore peculiarly within the domain of the police power.—Supreme Court of Louisiana, 71 S. R., 248.

**Taking Without Just Compensation—Prescribing Factory District.**

*In re Russell*.—An ordinance of the city of Niagara Falls forbidding the erection or operation of any factory within a prescribed district within the city limits, unless the owners of two-thirds of the residences and apartment houses located within 200 feet of the place where the factory was to be built and operated, consent thereto in writing, including an area used for more than 100 years exclusively for residence purposes, and some residences of historical interest, possessing an exceptional scenic beauty by reason of overlooking the rapids of the upper Niagara river and Niagara Falls, and being contiguous to a park and a state reservation, where the state had expended millions of dollars in acquiring and maintaining parks and grounds as appropriate surroundings for Niagara

Falls, was a proper exercise of the police power, not in violation of Const. N. Y., Art. 1, Section 4, forbidding the taking of private property for public purposes without just compensation.—Supreme Court, Special Term, Niagara County, 158 N. Y. S., 162.

**Deputy Marshal de Facto—Appointment of a Deputy de Jure.**

*Barter v. Mayor and Aldermen of City of Rockland*.—Where the deputy marshal of the city of Rockland, during the time of his service was merely deputy marshal de facto because an ordinance of the city required that a member of the police force be appointed deputy, while the incumbent was not such a member, he ceased to be such by the appointment of a police officer as deputy, who qualified over the incumbent and performed the duties of the office, since there cannot be an officer de jure and one de facto in possession of the same office at the same time.—Supreme Judicial Court of Maine, 96 A. R., 773.

**Highways—Establishment—Acceptance.**

*S. Branchlauch Co. v. Emery*.—Where a road, which was at first a meandering trail, winding along a stream through complainant's land, was regularly traveled for more than 10 years by the public as a road for automobiles, teams, horses and foot passengers, but there was no act on the part of proper public officials within the 10-year period, in the nature of exercising any control over or acceptance of the road as a public highway, such road did not become a public highway because of such user under the provision of Comp. Laws 1897, Section 4061, that all highways regularly established and all roads used as such for 10 years or more shall be deemed public highways, since under the act there must be an acceptance by the public authorities evidenced by some act of control over the road.—Supreme Court of Michigan, 157 N. W. R., 419.

**Engineer's Estimate — Effect of Partial Invalidity of Ordinance—Special Tax Bill—Suit to Cancel.**

*Gratz v. City of Kirkwood et al.*—An estimate of the cost of street improvements made by an engineer not employed by the city, which had no engineer, but signed by the mayor, who was authorized to make the estimate, is valid.

The invalidity of the provision of an ordinance for street improvements authorizing a committee to change the line, grade, plan, or form of the work, does not invalidate special tax bill issued for such improvements, where no change was made, since it can be eliminated without affecting the remainder, and it must be presumed that other bidders for the work knew that the provision was invalid.

A property owner who has full knowledge of technical defects in proceedings for street improvements, but makes no objection until the work is completed, cannot come into equity and ask the cancellation of tax bills issued therefor because of those technical defects.—St. Louis Court of Appeals, Missouri, 183 S. W. R., 1071.

**Alleys—Right of Public—Implication.**

*Balmat v. City of Argenta et al.*—Where parties platted land into city lots with intersecting streets and alleys indicated on the plat, which was duly acknowledged and filed for record, having attached the statement, in relation to the alleys, that they should remain open highways for the use of the owners of or residents upon the blocks through which they run, but that the alley in any block might be closed at any time by all the owners of lots in the block executing, acknowledging and placing on record in the recorder's office of the county a written instrument setting forth the closure, there was no dedication, expressly or by implication, of the alleys to the public, the reservation of the use of the alleys and right of closure to the owners or residents negating any implication of intent to irrevocably dedicate the alleys to public use; while the general rule is that in both express and implied common-law dedications there must be an appropriation of land by the owner to public use by some express manifestation of his purpose or by some act or course of conduct from which the law will imply the intent.—Supreme Court of Arkansas, 184 S. W. R., 445.

## NEWS OF THE SOCIETIES

### Calendar of Meetings.

**May 31-June 2.**—NEW YORK STATE CONFERENCE OF MAYORS. Annual conference, Syracuse, N. Y.

**May 31-June 2.**—NATIONAL ASSOCIATION OF COMPTROLLERS AND ACCOUNTING OFFICERS. Annual convention, Syracuse, N. Y.

**June 5-7.**—NATIONAL CONFERENCE ON CITY PLANNING. Eighth annual conference, Hotel Statler, Cleveland, O. Secretary, Flavel Shurtlett, 19 Congress St., Boston, Mass.

**June 5-9.**—AMERICAN WATER WORKS ASSOCIATION. Thirty-sixth annual convention, Hotel Astor, New York City. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

**June 6-10.**—INTERNATIONAL ASSOCIATION OF POLICE CHIEFS. Twenty-third annual convention, Atlantic City, N. J.

**June 12-16.**—SOUTH DAKOTA STATE FIREMEN'S ASSOCIATION. Annual convention, Yankton, S. D.

**June 13-15.**—MINNESOTA STATE FIRE DEPARTMENT ASSOCIATION. Annual convention, Chisholm, Minn.

**June 14-16.**—UNION OF SASKATCHEWAN MUNICIPALITIES. Annual convention, Swift Current, Sask. Secretary, W. F. Heal, Moose Jaw, Sask.

**June 14-17.**—AMERICAN INSTITUTE OF CHEMICAL ENGINEERS. Eighth semi-annual meeting, Cleveland, O. Secretary, I. C. Olsen, Cooper Union, New York City.

**June 15, 16.**—OHIO SOCIETY OF MECHANICAL, STEAM AND ELECTRICAL ENGINEERS. Convention, Cleveland, O. President, Joseph L. Skeldon, Toledo.

**June 20-22.**—NORTH CAROLINA GOOD ROADS ASSOCIATION. Annual convention, Wilmington, N. C. Secretary, Dr. Joseph Hyde Pratt, Chapel Hill, N. C.

**June 20-22.**—SOUTH CAROLINA STATE FIREMEN'S ASSOCIATION. Annual convention, Orangeburg, S. C.

**June 21-23.**—TRI-STATE WATER AND LIGHT ASSOCIATION OF THE CAROLINAS AND GEORGIA. Annual Convention, Isle of Palms, S. C. Secretary-treasurer, W. F. Stieglitz, Columbia, S. C.

**June 27-30.**—IOWA STATE FIREMEN'S ASSOCIATION. Annual convention, De Witt, Ia.

**June 27-30.**—AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual meeting, Pittsburgh, Pa. Secretary, Charles Warren Hunt, 220 West 57th St., New York, N. Y.

**June 28-30.**—MICHIGAN LEAGUE OF MUNICIPALITIES. Annual meeting, Battle Creek, Mich.

**June 27-30.**—AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, Atlantic City, N. J. Secretary, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

**July 5-6.**—GEORGIA STATE ASSOCIATION OF CHIEFS OF POLICE AND MARSHALS. Annual convention, Savannah, Ga. Secretary, J. P. Griffin, West Point, Ga.

**July 11-13.**—MUNICIPAL LEAGUE OF INDIANA. Annual meeting, Goshen, Ind.

**July 25-27.**—CENTRAL NEW YORK VOLUNTEER FIREMEN'S ASSOCIATION. Annual convention, Seneca Falls, N. Y. Secretary, Stewart W. Smythe, Cortland, N. Y.

**Aug. 7-9.**—CITY MARSHALS' AND POLICE CHIEFS' UNION OF TEXAS. Annual convention, Houston, Tex.

**Aug. 8-11.**—DOMINION ASSOCIATION OF FIRE CHIEFS. Annual convention, Windsor, Ont. Secretary, James Armstrong, Kingston, Ont.

**Aug. 21-27.**—PACIFIC COAST ASSOCIATION OF FIRE CHIEFS. Annual convention, San Diego, Cal.

**Aug. 28-31.**—NATIONAL TAX ASSOCIATION. Tenth annual conference, Indianapolis, Ind.

**Aug. 29-31.**—LEAGUE OF CITIES OF THIRD CLASS IN PENNSYLVANIA. Seventeenth Annual Convention, Johnstown, Pa. Secretary, Fred H. Gates, City Clerk, Wilkes-Barre, Pa.

**Aug. 29-Sept. 1.**—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Providence, R. I. Secretary, James McFall, Roanoke, Va.

**Sept. 6-9.**—LEAGUE OF AMERICAN MUNICIPALITIES. Annual convention, Newark, N. J.

**Sept. 4-8.**—SOUTHERN APPALACHIAN GOOD ROADS ASSOCIATION. Ninth annual convention, Lexington, Ky. Secretary, Dr. Joseph Hyde Pratt, Chapel Hill, N. C.

**Sept. 13-15.**—NEW ENGLAND WATER WORKS ASSOCIATION. Convention, Portland, Me. Secretary, Willard Kent, Narragansett Pier, R. I.

**Oct. 9-13.**—AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS. Twenty-third Annual Convention, Robert Treat Hotel, Newark, N. J. Secretary, Charles Carroll Brown, 702 Wulsin Building, Indianapolis, Ind.

**Oct. 16-21.**—NATIONAL SAFETY COUNCIL. Fifth Annual Safety Congress, Detroit, Mich. Secretary, W. H. Cameron, Continental and Commercial Bank, Chicago, Ill.

**Feb. 5-12, 1917.**—AMERICAN ROAD BUILDERS' ASSOCIATION. Seventh American Good Roads Congress and Eighth National Good Roads Show, Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York City.

### New Jersey Association of County Tax Boards.

Members of the various county tax boards throughout New Jersey, constituting the State Association of County Tax Boards, held a conference in the Assembly chamber at Trenton, May 9, with President Thomas B. Usher of Hudson county presiding. As required by a resolution adopted at the meeting of the executive committee held in Newark, January 22 last, reports of boards throughout the state were read by Secretary William P. Macksey of Newark, a member of the Essex Tax Board.

In his report Mr. Macksey declared "that a greater part of the criticism directed at the county boards is due in a large sense to the lack of knowledge that the taxpayers have in regard to the work and efforts of the boards to equalize and revise assessments." He added that "the larger part of this criticism is directed at some of the smaller counties which have shown no disposition to perform the functions for which they were created." He submitted a brief synopsis of reports turned into him by all but two of the counties.

The conference was decided upon by the State Board of Taxes and Assessments, acting in conjunction with a committee representative of county tax boards. It is proposed to make the conference an annual affair.

The following officers were re-elected for the ensuing year: President, Thomas B. Usher, Jersey City; vice-president, Frank McLees, Bergen; secretary, William T. Macksey, Newark; treasurer, Andrew E. Kenny, Somerset.

During a discussion of tax subjects there seemed to be unanimity of opinion that local assessors should have greater latitude and should be protected by civil service under the supervision of county boards.

"The Essex report gives serious consideration to the matter of placing assessors under civil service, and stated that experience convinces the board that the assessors should be removed

as far as possible from all political influence, and suggests that this could easily be effected by selecting competent men, enlarging their territory and fixing the compensation at an amount sufficient to warrant devoting their whole time to the performance of their duties.

"Hudson county called special attention to the fact that the most glaring inequalities were found to exist in all classes of property, and it caused reassessments to be made of the entire county, in some instances making the reassessments where the assessors refused to do so or were incapable of carrying out the instructions of the board. It also reported that it is now preparing for distribution throughout the county maps showing the rate of lot assessments on every block frontage. These maps will be accompanied by an invitation for criticism from taxpayers and others conversant with values.

"Somerset county made a very complete report and dwelt especially upon its work of equalization by classification of all farm lands by a card index system; also that it is handling town properties on the same system with modifications to meet the requirements. The classification abounds in valuable statistics and shows all of the farms from 20 acres in size upward; shows the discrepancies in valuations on farms of the same acreage in one section as against another section; gives condition of road, distance from school, distance from railroad, etc. By this system it found that a large number of complaints, which might appear to be discriminations, are really not discriminations but errors, and when they are errors, by this method they can be easily rectified because the facts are before it in detail."

The Newark system of real estate assessment interested the state, county and municipal assessors and was explained by President John Howe of the Newark Board of Assessors as follows:

"The preliminary work in connection with our method starts early in the year. Our board organizes immediately after January 1 and begins to take up the matter of the land assessments at once. While under the laws of our state all property is assessed as of May 20, there is nothing to prevent us from making observations and inspections of the different sections of the city, and, in a large municipality like Newark, it is necessary for us to get an early start.

"For correcting, revising and levying assessments on land we use street maps. Separate maps for each street in the city are made by the surveyors' department of our office. These maps are of a uniform scale, 50 feet to the inch, and show both sides of each street for its entire length, and are made in strip form so that they can be conveniently rolled up. Nothing appears on the maps except the outline of the property, the number of the block and lot and the street number.

"The names of the owners of the



property do not appear, so that when our board receives information relative to sales of property in a certain section, or mortgages reported against the same, or any information that would indicate that the assessed value is not up to the true value of the property, and we decide to increase the valuations, reference is made to these maps, the new rate per foot at which the land is to be assessed is inserted alongside the property on the maps and all property in the section in which the raise is made is treated alike, according to its location, the Tax Board not being interested in who the owner may be.

"It is generally supposed that the valuing of real estate is a simple and easy duty, while, as a matter of fact, we consider it the most difficult of all classes of property to assess, for the reason that it seems to be the object of every buyer and seller of real estate to conceal the true consideration, and insert in the deed instead 'one dollar and other good and valuable considerations.'"

The value of tax maps was considered in a paper by A. C. Pleydell, of Plainfield, which showed that at the time of the passage of the present law only 48 of 493 taxing districts in the state had maps sufficiently accurate to be of value in connection with the assessments.

By the unanimous adoption of a resolution, the association went on record as favoring assessments by the street and road system, instead of alphabetically, the latter practice being followed in some districts. The principal reason advanced for the resolution was that the street and road system offers a more convenient method of comparing assessments upon adjacent or adjoining properties.

#### Michigan Good Roads Association.

Phil T. Colgrave of Hastings was re-elected president of the Michigan Good Roads association at the thirteenth annual convention held at Battle Creek, May 10 and 11. Other officers are: Vice-president M. P. Hull, of Diamondale; secretary, A. A. Anderson, Hastings; treasurer, J. Edward Koe of Lansing.

That good roads are essential to resuscitate a decadent school system in Michigan was the burden of Governor Ferris's talk.

"Our present school system, especially in the rural districts, is a dead one," he said. "Our greatest channel through which to revise this system is better roads, which would, in course of time, result in the consolidation of the schools. By such consolidation, more efficient instructors could be employed."

Urging that Michigan adopt the patrol system for maintenance of its good roads, M. O. Eldridge, of the United States department of agriculture, Washington, D. C., declared that if a railroad used the same system of maintenance as prevails with the average improved road, steam engines soon would be unable to run 100 consecutive miles.

Eldridge also declared that road districts, in Michigan or elsewhere, which essay to build good roads without the services of a competent engineer, are wasting their money. He advised that advertising bill boards along improved roads be removed in the interests of an attractive landscape.

District Engineer W. W. Cox of Kalamazoo, speaking on "Road Maintenance," declared that the patrol system is now making great strides over the spasmodic gang system heretofore employed. He urged that weeds, brush and grass alongside improved roads be cut regularly, so as to assure a clear view for 150 feet.

Cox took the stand that proper drainage is the greatest need for good

(Continued on page 777.)

## PERSONALS

Brett, J. E., has been elected chief of the Fayetteville, N. C., police department.

Carlson, C. E., has been appointed chief of the Tacoma, Wash., fire department.

Dalrymple, Alfred N., county counsel of Essex county, N. J., for many years leader of the Republican party in Newark and Essex county, and more recently regarded as the state leader, died recently in the General Hospital in Dover, N. J., from injuries he suffered in an automobile accident.

Duggan, C. C., and Hearn, L. G., have been appointed superintendent of waterworks and sewer and street commissioner, respectively, of Paris, Tex.

Harley, William, has resigned as city engineer of Hartford City, Indiana.

Hunter, J. B., has been appointed city engineer of Denver, Colo.

Macallum, Andrew F., city engineer of Hamilton, Ont., has been appointed commissioner of works of Ottawa, Can.

Ostendorf, Henry J., has resigned as chief of the Covington, La., fire department.

Tonnele, L. J., has been elected president of the North Jersey District Water Supply Commission.

Meyers, Frederick Holmes, a civil engineer of the Board of Water Supply, New York City, died recently of heart failure. Mr. Meyers was born in Alleghany City, Pa., on April 28, 1871, and was engaged for a long time in the construction work on the northern aqueduct division of the Catskill Aqueduct.

Officers have been elected as follows:

De Ridder, La.—Mayor, C. C. Davis; city marshal, Charles Baden; aldermen, Ward 1, W. E. Cooper; Ward 2, H. H. Pitman; Ward 3, J. M. Bailey; Ward 4, W. I. Cobb, and alderman-at-large, Dr. J. F. Love.

Delcambre, La.—Mayor, Fernand Landry; councilmen, Theo Trahan, Theo LeBlanc, Laodis LeBlanc.

Abita Springs, La.—Mayor, Joseph Bordes; aldermen, C. Burdenstock, P. Beudean, E. Terrebonne, J. Lamousin, G. Strain.

## BOOK REVIEW

**GOOD ROADS YEAR BOOK.**—American Highway Association, Colorado Building, Washington, D. C. 440 pages, \$1 (five for \$4).

The fifth annual edition (1916) of the Good Roads Year Book, which is published by the American Highway Association, has just been issued. It contains very valuable information including reports from all state highway departments, a review of highway work for the year, and a digest of state highway specifications. Most of the 440 pages are devoted to interesting information concerning roads; a small amount of space in the rear is given over to a list of road and allied organizations with the names of the officials.

The book first gives a brief outline of the organization and work of the United States Office of Public Roads and Rural Engineering, and a list of the publications of this office. Following this is a comprehensive report from the highway department of each state in which are discussed state aid legislation, local road legislation and convict labor laws and methods. A list of the state highway officials, automobile license fees, road funds available or spent by counties and states, and a progress report covering the work done by each state department during the year are also included. Reports are also printed covering similar points from the provinces of Canada. The above constitute Part I.

Part II. consists of historical notes, technical details of road construction and maintenance and a description of European road systems. Several pages are devoted to the history of road building and to the effect upon this science of such inventions as the steam roller and the stone crusher.

Brief descriptions are given of the road systems of foreign countries, mostly European. Types of roads are considered fully, all kinds from earth to the more expensive types being treated. Specifications are given for the construction of bituminous macadam roads and for the asphaltic materials. There are also chapters on road maintenance and repair and dust prevention. Types of bridges and culverts are discussed and standard plans given.

Other matters include a short description of patented methods of road construction and a digest of state highway specifications for macadam, bituminous, brick and concrete roads and the materials of construction.

In Part III. is given a dissertation on bonds with theory of interest, interest calculations, discount, annuities, sinking funds, annuity loans, dividends, interest tables, etc. There is given also a list of publications and treaties on road, bridge and culvert construction, and allied subjects. A list of state geologists, manufacturers of road equipment and material and of trade names brings the reader to the section devoted to Road and Allied Associations.



# NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

## MULLEN GRAVEL HEATER AND DRYER.

### Of New Type for Contractors' Large Capacity Service.

The problem of the efficient heating and drying of gravel, grit and crushed stone is receiving increasing attention from contractors, and the old methods of sticking a pipe through a pile of material on the ground and lighting a fire in it, or raising a flat iron plate on stones and building a fire under that are rapidly being replaced by machines.

Labor, fuel, time and patience must be saved and the material be heated and dried in such a way that all the heat is utilized for the purpose desired. The main types of machines are the drum type, requiring power to operate, and the small pan arrangement with limited capacity.

Some years ago a New York City paving contractor engaged on a large granite block paving job that required hot tar and hot dry gravel for the joint filling, was having difficulty in following up the pavers with his joint filling. This man suffered so much inconvenience because of his lack of proper equipment for the purpose of heating and drying the gravel that he was

forced to give the subject serious thought and study; the result is a machine used in New York City, and known as the Mullen gravel heater.

This machine, which is shown in the accompanying illustration, is strongly and simply constructed. The furnace consists of a multiple-perforated sheet of heavy metal, bent over roof-like to form the two heating sides. In cross-section it resembles an inverted letter V. At the ends of this multiple-perforated sheet are two solid end plates, in one of which is a fire door, and to which also are fastened the multiple-perforated flights that are arranged down the sides of the furnace to form the heating chambers and the hopper that is arranged above the point of the furnace. The perforated flights are about 3 inches distant from the furnace sides at their bottoms, and about 5 inches away at their tops, causing the gravel that passes under them to do so in a stream averaging about 4 inches in thickness. The hopper discharges on both sides of the furnace under the top-most perforated flight on either side, having two 5-inch openings, separated by the point at the top of the furnace. A smokestack is arranged at the top of the furnace for starting the fire; and grates, wheels, ash pans, hot gravel

pans, etc., are arranged at the bottom in the usual way.

But one man is required to operate the machine. He tends the fire, shovels coal, wet gravel into the hopper and shovels hot, dry gravel away at the bottom into wheelbarrows to be taken to the work, and he need not work overtime. As he removes the hot, dry gravel banked at the base of the machine, the gravel from the hopper gravitates freely down over the multiple-perforated furnace side and under the multiple-perforated flights until it is again banked at the base. It is claimed that only a small amount of fuel is required to heat and dry a large amount of gravel in this machine, due to the construction of the machine, practically all the heat from the fire passing out through the multiple perforations in the furnace sides, through the voids of the gravel or stone, and then escaping either through the spaces between the flights or through their multiple perforations. The machine shown in the illustration has a capacity of about 4 tons of gravel per hour, or 40 tons per 10-hour day. The temperature of the hot, dry gravel can be regulated by the length of time that it remains in the multiple-perforated heating compartments on the sides of the furnace. It is said to be not difficult to get a large yield of material perfectly dry and heated to about 200 degrees Fahrenheit.

There is also a Mullen combination tar pot and gravel heater, in which the gravel heating and drying section is built on the same principle. This is used more for repair work along street railway tracks, and for patching the tops of bituminous roads.

The purposes to which these heaters have been put to date are for heating and drying gravel, slag, grit and crushed stone for paving joint filling, roofing, top dressing of bituminous roads, and winter concrete. When concrete must be mixed in cold weather, this heater is designed to bring the stone to a sufficient temperature to heat the sand, cement and water that must be mixed therewith, and maintain the batch in place sufficiently warm to keep it from freezing before setting. This was done, for instance, in finishing up a bridge abutment. The Mullen gravel heaters have been used, for example, by the contractors and street railway companies of New York City for a number of years. The Third Avenue Railway system has purchased seven to date, and the Brooklyn Rapid Transit system has five.

Littleford Brothers, of Cincinnati, O., who are extensive manufacturers of melting kettles and other contractors' and industrial equipment, have secured from the inventor and patentee,



MULLEN GRAVEL HEATER AND DRYER.

Charles A. Mullen, of New York City, a license to manufacture and sell these heaters, and will henceforth handle them along with their general line.

### COMBINATION CONCRETE MIXER AND ROAD ROLLER.

#### Especially Designed for Concrete Road Building.

Every highway contractor finds it necessary to have at least two big machines—a concrete mixer and a road roller—in order to build concrete roads or roads with a concrete foundation. In order to make this number still less and to supply a general utility machine, the Niagara Concrete Mixer Company, 99 Oak street, Buffalo, N. Y., has developed a combination steam-driven road roller and concrete mixer.

The machine weighs 24,000 pounds, with road roller wheels; 15,000 pounds with small wheels. The entire machine is controlled by one man from one platform, all levers being within reach. He is not required to leave the operating platform excepting to stoke the fire occasionally.

The machine is capable of rolling at a speed of 9,284 feet per hour. The power is developed from a dry back horizontal boiler of 16 to 18 h. p. (at 125 pounds steam), by means of a pair of 5 x 5 twin engines, with a speed of 300 r. p. m. The machine has two speeds forward, and is reversible at

each speed. The power is transmitted through cast steel gears. The power transmission is sturdily built, as is the whole machine.

The rear roller wheels are each 60 inches diameter by 17 inches face. The front roller is 34 inches diameter by 5 feet 9½ inches face, and is constructed as four separate wheels. Smaller wheels are also supplied with the machine to be used as desired. The overall length of the machine is about 10 feet, height 12 feet 6 inches, with roller wheels; rolling width approximately 9 feet.

Forming a compact and integral part of the roller, there is mounted a heart-shaped concrete mixer, which has a capacity of 14 to 16 cubic feet per batch, with a drum speed of 16 r. p. m. The drum is 48 inches diameter by 44 inches in length. The hopper speed is from 8 to 15 seconds. There is a boom delivery of any length desired, but the drum is high enough to permit a gravity chute to be used to any part of the roadway. The center of the discharge end of the drum is 6 feet 9 inches above the ground.

The machine is not being marketed as an asphalt roller, but is primarily intended to enable the contractor to roll the sub-grade at night, and then to mix concrete during the day, all with the same machine. The accompanying illustration gives a view of the machine.

Wolverine Portland Cement Co.; Wm. Dickinson, Marquette Cement Manufacturing Co.; D. McCool, Newaygo Portland Cement Co.; Robt. F. Hall, Portland Cement Association; Arthur Cameron, Municipal Engineering & Contracting Co.

The Central Foundry Company, 90 West street, New York City, announces that, owing to the increasing importance of its western business, a vice-president of the company will maintain an office in Chicago. C. C. Todd, who for many years has represented the company in the west, and who about a year ago was elected a vice-president of the company, will open the Chicago office on July 1, 1916.

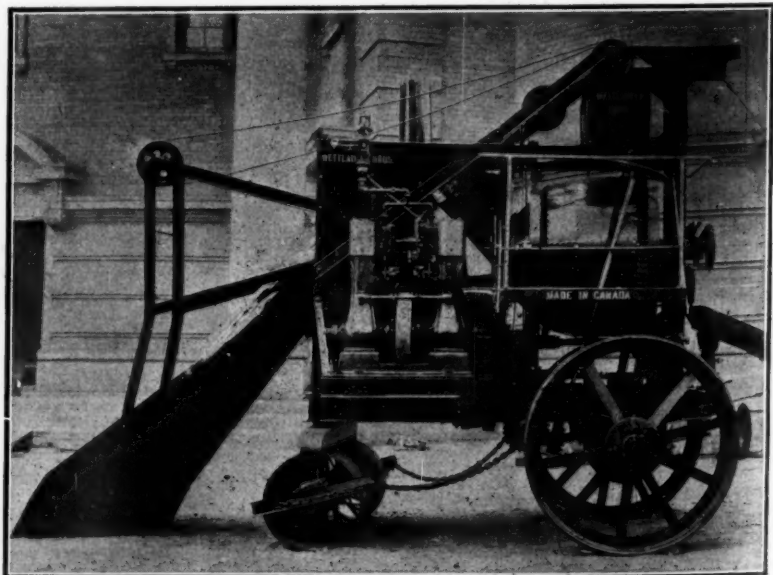
**Concrete Pipe in Drainage Work.**—Among the first land to be irrigated by the Mormons, some twenty-six years ago in Utah, was an area lying about thirty-five miles northwest of Ogden and bordering on Great Salt Lake. As happens in the arid regions where irrigation is necessary to carry on agriculture, this land has become so waterlogged that to restore it to its original productiveness, drainage became necessary. With this object in view, the Corinne, Utah, Drainage District was organized and bonds voted to the extent of \$175,000 to raise the necessary funds to reclaim these lands. It is noteworthy that after some promotional work by the Portland Cement Association, which was represented by C. M. Wood, manager of the Cement Products Bureau of that association, the sponsors of this drainage district have been converted to the use of concrete pipe for the development of this region, which will require something over 200 miles of pipe. The quantity of cement that will be utilized in this particular work will range from 8,000 to 10,000 barrels, which is not so large an amount as one would naturally expect, simply because few pipe of large diameter are

## INDUSTRIAL NEWS

**Cast Iron Pipe.**—Chicago—The Glamorgan Pipe & Foundry Company will furnish 200 tons of pipe for Denmark, Wis., and the leading interest 250 tons for Akron, O. Quotations have been received at Newton, Kans., for 1,800 tons; at Brookfield, Ill., for 560 tons, and at Fargo, N. Dak., for 176 tons. Quotations: 4-inch, \$33.50 to \$34; 6-inch and larger, \$30.50 to \$31; Class A, \$1 extra. Birmingham—Running from 80 per cent capacity to full time and double turn is the report from the large water pipe shops. All sections of the country, except the last, are represented in new orders, none very large, but considerable in the aggregate. No new export business is reported. Quotations: 4-inch, \$29; 6-inch and up, \$26; 16-foot length, \$1 extra. New York—No public lettings of importance have been announced in this immediate territory. The Warren Foundry & Machine Company was the successful bidder at the letting of 172 tons at Wellesley, Mass. Private buying has been in good volume. Prices are firm, especially on small sizes, on which most foundries are practically sold up for the next two or three months. Quotations: 6-inch, Class B and heavier, \$30.50; Class A, \$31.50.

**Lead.**—Lead has become easy in the absence of demand. Quotations: New York, 7.45 cents; St. Louis, 7.25.

**Cement Products Exhibition Co.,** at its annual meeting, held May 23, elected the following officers: President, B. F. Affleck; vice-president, A. Y. Gowen; secretary, Blaine S. Smith; treasurer, J. U. C. McDaniel. The directors elected were the following: B. F. Affleck, Universal Portland Cement Co.; A. Y. Gowen, Lehigh Portland Cement Co.; J. U. C. McDaniel, Chicago Portland Cement Co.; Blaine S. Smith, Universal Portland Cement Co.; W. E. Cobean,



NIAGARA COMBINATION ROAD ROLLER AND CONCRETE MIXER.



necessary in the development. W. M. Bostaph, a prominent civil engineer of Salt Lake, has been selected as chief engineer of this work, which will result in 200,000 acres of land being restored to profitable production. A cement products plant, especially to provide the pipe necessary for this reclamation, will be erected at Corinne at a cost of \$30,000.

## NEWS OF THE SOCIETIES

(Continued from page 773.)

roads. He also recommended that townships and counties in building roads put in the driveways connecting with them. The supreme court has ruled that this is up to the property owners, but, according to Cox, it's a wise township that tends to this itself.

Highway Commissioner Frank F. Rogers said:

"The problem of materials for good roads making is one for county commissioners to solve. Several things must be taken into consideration, available funds, the availability of materials for roads of various classes, soil and traffic conditions, both as regards the amount and the kind."

Mr. Rogers said that two-fifths of the road mileage of the United States subject to state reward is built of gravel. Washington leads, Michigan is second, and Utah third.

One-sixth is sand and clay mixture; one-fifth is water-bound macadam. Five per cent. is a macadam with a gravel top and 4 per cent concrete. California leading with 800 miles of the latter.

L. H. Nelson, district engineer, Cadillac, who has had wide experience constructing government roads in the Philippines, gave a technical address on gravel road building, declaring that gravel is the most satisfactory material to use on the average Michigan road, if the material is close at hand. He added that no amount of rolling will make a gravel road as good as macadam, though every gravel road should be rolled well after each rain.

W. J. Cleary, engineer for Berrien county, in a talk on "bituminous surfaces," said: "Congress thinks nothing of appropriating several hundred thousand dollars for taking the snags out of some river to let a few boats go up and down, but when it comes to building good highways for millions of people, there is nothing doing."

"People are clamoring for good roads faster than money can be provided for construction work," said Cleary. "St. Joseph county had no trouble selling \$500,000 in bonds at 4 per cent. to her own people for good road building. St. Joseph county has farm land assessed as high as \$301 an acre, as the result of good roads."

L. C. Smith, department highway commissioner of Michigan, gave an interesting talk on road laws.

D. G. Look, of Lowell, reporting for Kent county, stated that, thanks to a

bond issue of \$600,000, his county has completed 100 miles of good roads. Of the \$600,000 some \$50,000 was set aside for tools, machinery and gravel pits, the rest was spent on actual road building. Gravel roads prevail, he explained. Maintenance is accomplished by the use of prisoners. Their pay is retained until their term expires, said Mr. Look, and the men are so glad of the chance that they do not try to escape.

### Georgia Drainage Association.

The fifth annual session of the Georgia Drainage Association was held at Monroe, Ga., May 5. The election of officers resulted as follows: President, A. R. Lawton of Savannah; secretary and treasurer, S. W. McCallie of Atlanta; vice-presidents, L. R. Akin of Brunswick, P. H. Comas of Baxley, W. H. Leahy of Atlanta, John Dozier Pou of Columbus, T. A. Pate of Snellville and J. A. Pirkle of Monroe.

Dr. L. G. Hardman of Commerce delivered an address upon the subject of "Tile Drainage in Georgia." Dr. Hardman's practical experience with this character of drainage on his several large farms in north Georgia especially fitted him for the discussion of the subject, which he handled thoroughly and with much interest.

President A. M. Soule of the State College of Agriculture at Athens commanded the closest attention of those assembled in his discussion of tile drainage and proper land preparation, and the address was one of much practical benefit.

"Defects in Our Present Drainage Law" was the subject ably and convincingly discussed by John J. Nunnally and Dr. John A. Pirkle of Monroe. Mr. Nunnally was the pioneer in the Jacks creek drainage movement, while Dr. Pirkle is the prime mover in the Alcovy river enterprise.

### Arizona Good Roads Association.

At the annual meeting of the Arizona Good Roads Association, held at Phoenix, May 15 and 16, the following officers were elected: President, Dwight B. Heard; vice-president, Gustav Becker; secretary, Harry Welch; treasurer, A. J. Chandler; vice-presidents—George W. P. Hunt, governor of Arizona; A. L. Gunstetter, Nogales; Harold Steinfeld, Tucson; M. J. Cunningham, Bisbee; A. J. Eddy, Yuma; Rev. Cyrus Vavle, Flagstaff; Pat Rose, Globe; Tom Campbell, Prescott; directors—W. Y. Price, Pinal; J. J. Bower, Cochise; J. W. Francis, Coconino; Wm. Stephens, Yavapai; F. T. Colter, Apache; L. H. Manning, Pima; Geo. A. F. Fotte, Graham; Sam Abraham, Greenlee; W. H. Keegan, Globe; J. E. Perry, Mohave; Warren Peterson, Maricopa; Allen T. Bird, Santa Cruz; A. B. Wing, Yuma; W. B. Wood, Navajo.

The president, D. B. Heard, at his annual address paid a tribute to good roads workers, and said that next to the schools good roads were the most necessary possessions of a community.

"There are more good roads in Ari-

zona now, and more new roads under construction than at any time in the history of the state." He read the following list of county bond issues now being drawn upon or soon to be in use:

Apache .....	\$125,000
Navajo .....	65,000
Mohave .....	100,000
Yuma .....	500,000
Pima .....	400,000
Santa Cruz .....	150,000
Pinal .....	150,000
Gila .....	350,000
Greenlee .....	150,000

Total ..... \$1,990,000

State Engineer Lamar Cobb said federal aid was in sight, and that the government would contribute to the construction of main highways soon, for the first time in 75 years.

"Three-quarters of a century ago, the government spent seven million dollars on roads. It then became discouraged, and has never resumed this sort of work."

"To show the amount of interest in federal-aid roads, I need only state that at the present session of congress there were 63 road bills introduced."

Mr. Cobb then told about the manner in which the Bankhead bill, summarizing the efforts of highway engineers of seven states, had been drafted at a conference in Oakland, Cal., and how that bill in slightly varying forms had passed both houses of congress. The senate bill, rather more favorable to Arizona, will be placed before conferees of both houses and will probably be the form in which the measure will become a law. This distributes the appropriation over the states on a basis of area, population and length of post roads. The house bill would call for the expenditure of \$117,000 a year in Arizona, while the senate bill will bring \$77,000 the first year and graded amounts up to \$359,000 the fifth year. For each dollar the government puts up, the state is to supply another.

Grading equipment and costs were ably treated by J. C. Ryan, engineer of Cochise county, and by F. B. Twitchell, of the state engineering department. Mr. Ryan, who read his paper first, treated the subject of practical work as demonstrated in Cochise county. He described work on all types of roads, giving statistics based on the book-keeping in his department in Cochise county.

Mr. Twitchell advocated standardized portable and lightweight road building machinery. Both engineers went on record strong for motor trucks. Twitchell held out in favor of light trucks where the country is rough.

County Engineer Stafford of Pinal county created considerable discussion and no end of interest when he described road work in his division. He showed photographs of a road grader drawn by motor truck, which operates on proper soils, grading the road at the rate of \$7.45 a mile, which is extremely low cost.



# ADVANCE CONTRACT NEWS

## ADVANCE INFORMATION BIDS ASKED FOR

## CONTRACTS AWARDED ITEMIZED PRICES

To be of value this matter must be printed in the number immediately following its receipt, which makes it impossible for us to verify it all. Our sources of information are believed to be reliable, but we cannot guarantee the correctness of all items. Parties in charge of proposed work are requested to send us information concerning it as early as possible; also correction of any errors discovered.

### BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
<b>STREETS AND ROADS.</b>				
O.	Steubenville	June 3	3,200 yds. brick pavem't and 6,600 sq. yds. cement walk.	City Engineer.
O.	Middleport	noon, June 3	Sidewalks on several streets.	T. Middleton, Jr., City Engr.
Wis.	Oshkosh	10 a.m., June 3	Pav. with coner., sarcolithic, brick, bit. concrete.	Geo. H. Randall, City Engr.
Minn.	Swatara	9 a.m., June 3	3 miles of road.	A. A. Heath, Macville Town Supervisor, P. O.
N. J.	Hackensack	11 a.m., June 5	Sand-distributing wagon, 1-ton auto truck, heavy reversible road grader, street sweeper, asphalt kettle with stone dryer, scarifier, sprinkling wagon, 2 dump carts.	Bergen Co. Engineer.
Pa.	McKees Rocks	8 p.m., June 5	Paving with brick or concrete.	Geo. H. McGinness, Boro. Engr.
Ind.	Paoli	2 p.m., June 5	Grading, curbing, paving and improving road.	E. A. Palmer, Co. Aud.
Wyo.	Sheridan	10 a.m., June 5	Grading and surfacing street.	T. A. Morris, City Clerk.
O.	McArthur	noon, June 5	Grading, removing old pavement and constructing concrete walks.	City Clerk.
N. D.	Grand Forks	June 5	50,000 sq. yds. concrete pavement.	W. H. Alexander, City Aud.
Minn.	Minneapolis	11 a.m., June 5	Paving with concrete on road No. 31.	Al. P. Erickson, Co. Auditor.
Ind.	Greenfield	10 a.m., June 5	Concrete, macadam, brick and gravel roads.	H. J. Rhue, County Auditor.
Wash.	Blaine	June 5	Concrete and asphalt paving; cost \$18,000.	E. E. Pruner, City Clerk.
Ind.	Newport	10 a.m., June 5	Paving and graveling roads.	Roy Slater, County Auditor.
Ind.	Fowler	1 p.m., June 5	Constructing township roads.	Warren Mankey, Co. Auditor.
Ind.	Cannelton	noon, June 5	Two miles macadam road.	M. C. Conway, County Aud.
Miss.	Charleston	June 5	Constructing 1 1/4 miles of road.	D. S. Henderson, Clerk, Co. Supervisors.
Ind.	Greensburg	June 5	Constructing township roads.	J. C. Barbe, Co. Auditor.
Ind.	Scottsburg	1 p.m., June 5	2 1/2 miles gravel road construction.	Robert Blount, County Aud.
N. J.	Perth Amboy	June 5	Bituminous pavement on concrete base.	Street Commissioner.
Wis.	West Allis	June 5	Grading and paving with concrete.	City Engineer.
N. Y.	Port Jervis	8 p.m., June 5	5,500 yds. brick pavement.	Irving Righter, City Eng'r.
Wash.	Waterville	June 5	4 1/2 miles stone road, cost \$20,000.	Robt. Foster, Co. Engr.
La.	New Orleans	June 5	Constructing 13.4 miles gravel road.	State Highway Dept.
N. J.	Union Hill	June 5	Repaving 8 streets with asphalt.	City Clerk.
Ind.	Kokomo	June 5	Paving and curbing several streets.	Ben Havens, City Clerk.
Wis.	West Allis	June 5	Grading and paving with concrete.	Board of Public Works.
N. D.	Larimore	7 p.m., June 5	Constructing sidewalks and curbs during 1916.	N. J. Powell, City Auditor.
N. Y.	Port Jervis	June 5	Paving East Main Street.	City Engineer.
O.	Cleveland	noon, June 5	Paving at Cleveland Heights.	F. A. Pease Engineering Co., Marshall Building.
Ind.	Brownstown	2 p.m., June 5	Road construction.	Albert Luedtke, Co. Auditor.
Ind.	Greencastle	2 p.m., June 5	19,500 ft. macadam and gravel roads.	County Auditor.
Ind.	Portland	10 a.m., June 5	Macadamizing county road.	John Bonifas, Co. Auditor.
Miss.	Gulfport	June 5	60 miles hard surface road construction.	Harrison County Com'rs.
N. Y.	Albany	1 p.m., June 5	Constructing and repairing highways in sev. counties.	Edwin Duffey, State Highway Commissioner.
Wash.	Everett	June 5	Hard surfacing 1.1 miles of road.	Mae Weatherbee, County Aud.
Wash.	Asotin	June 5	Highway work, cost \$10,000.	V. G. Shellman, County Engr.
Ind.	Valparaiso	June 5	Constructing stone road.	County Auditor.
Va.	Gate City	June 5	Improving roads, \$43,800 available.	E. V. Martin, Engineer.
Ind.	Versailles	noon, June 5	Grading, paving and improving roads.	J. T. Lochard, Co. Auditor.
Ind.	Hartford City	2 p.m., June 5	Constructing two roads.	Co. Auditor.
Miss.	Columbus	June 5	20 miles of road; \$60,000 available.	C. L. Wood, Engineer.
Ind.	Vernon	June 5	Constructing two miles stone road.	G. J. Bernhart, Co. Auditor.
Ind.	Salem	1.30 p.m., June 5	Grading, paving and improving roads, four jobs.	I. H. Rutherford, Co. Auditor.
O.	Columbus	noon, June 5	Grading and macadamizing road.	John Scott, Clerk, Co. Comrs.
N. J.	Northfield	8 p.m., June 5	Curbing on Shore road.	Eugene Swilkey, City Clerk.
N. J.	Bloomfield	8 p.m., June 5	6,500 sq. ft. concrete and stone sidewalk, 4,200 ft. blue-stone curb, etc.	Ernest Baechlin, Town Engr.
Cal.	San Jose	11 a.m., June 5	Improving several roads.	I. L. Ryder, Co. Surveyor.
Minn.	St. Paul	10:30 a.m., June 5	Grading several streets.	August Hohenstein, Pur. Agt.
Ky.	Louisville	2 p.m., June 5	Paving several streets with brick.	Roger M'Grath, Sec. Bd. Pub. Works.
Cal.	Redwood City	10 a.m., June 5	Constructing section of Mission road.	J. H. Nash, Co. Clk.
Mo.	Sedalia	June 5	Grading, curbing and paving, cost \$7,300.	F. T. Leaming, City Engr.
N. C.	Kinston	June 5	Constructing 32 miles sand-clay road.	R. F. Churchill, Chmn. County Commissioners.
O.	West Park	Noon, June 5	Constructing sidewalks on four streets.	Lander Engineering Co., American Tr. Bldg., Cleveland.
Wash.	Waterville	June 5	Constructing highways, cost \$20,000.	County Commissioners.
La.	New Orleans	June 5	13.4 miles gravel road.	Highway Dept., State Bd. of Engineering.
Miss.	Louisville	11 a.m., June 5	Sand-clay roads.	B. M. McCully, Clerk, County Commissioners.
O.	Defiance	2 p.m., June 5	Grading and macadamizing 9,339 ft. of road.	Roger Daoust, Clk. Co. Com.
Pa.	Mt. Jewett	5 p.m., June 5	Grading, curbing and paving.	A. O. Lantz, Boro. Sec'y.
N. J.	Union	June 5	Repaving with asphalt block and bituminous concrete.	Emil Bautz, Town Clerk.
Wash.	Goldendale	June 5	Three miles of highway, cost \$17,000.	L. W. Ward, County Engr.
Cal.	Hanford	June 5	Furnishing road grader and traction engine.	E. F. Pickrell, Clk. Co. Spvs.
N. Y.	Elmira	June 5	Grading, curbing and paving 22,000 sq. yds.	L. C. Andrews, City Clerk.
Del.	Georgetown	June 5	Resurfacing road.	M. T. Gun, Co. Rd. Engr.
Mich.	Kalamazoo	June 5	600,000 paving bricks and 25,000 sq. yds. asphaltic conc.	City Clerk

## BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
Wash.	Vancouver	June	6.. Two miles waterbound macadam.....	W. A. Schwarz, Co. Engr.
Wash.	Ephrata	June	6.. 3 1/2 miles county road and two bridges.....	E. H. Spaulding, Co. Engr.
N. J.	Paterson	June	6.. Applying road oil to macadam streets.....	Colin McLean, St. Comr.
O.	Dayton	noon, June	6.. Paving with 3 1/2-in. wood block on 6-in. concr. found't'n.....	J. E. Barlow, Dir. P. S.
Ariz.	Phoenix	5 p.m., June	6.. Improving streets.....	City Engineer.
Ind.	Delphi	noon, June	6.. Constructing gravel or macadam road.....	H. B. Good, Co. Auditor.
Ind.	Martinsville	1.30 p.m., June	6.. Grading, curbing and paving roads, two jobs.....	Sam Waterson, Co. Auditor.
Ind.	Rensselaer	1 p.m., June	6.. Grading, curbing and paving roads.....	J. P. Hammond, Co. Auditor.
Ind.	Monticello	10 a.m., June	6.. Grading, curbing and paving roads.....	A. G. Fisher, Co. Auditor.
Ind.	Crawfordsville	10 a.m., June	6.. Grading, curbing and paving roads, two jobs.....	Dr. W. F. Batman, Co. Aud.
Ind.	Angola	1 p.m., June	6.. Improving gravel road 3 miles long.....	F. C. Dewey, Co. Auditor.
Tenn.	Johnson City	7:30 p.m., June	6.. 13,652 sq. yds. asphalt, asphaltic concrete, concrete or Tarvia and 11,000 ft. curb and gutter.....	P. F. McDonald, City Engr.
Texas	Fort Worth	June	6.. Paving one mile of streets.....	City Secretary.
Miss.	Tchula	June	6.. Constructing sidewalks (\$4,000 available).....	W. W. Gwin, Mayor.
Ind.	Rockville	11 a.m., June	6.. Constructing gravel roads.....	County Auditor.
Ind.	Bloomfield	2 p.m., June	6.. Constructing macadam road.....	G. E. Kidd, County Auditor.
Ind.	Boonville	10 a.m., June	6.. Constructing rock roads.....	G. H. Bass, County Auditor.
Ind.	Knox	noon, June	6.. Constructing township roads.....	C. Weninger, Co. Auditor.
Ind.	Kokomo	10 a.m., June	6.. Macadam and asphaltic concrete roads.....	W. L. Benson, Co. Auditor.
Ind.	Lebanon	10 a.m., June	6.. Constructing township road.....	C. Goodwin, Co. Auditor.
Ind.	Marion	10 a.m., June	6.. Constructing gravel road.....	M. McRae, County Auditor.
N. J.	No. Arlington	8 p.m., June	6.. Laying sidewalks on Kearney avenue.....	William Huff, Engineer.
Ind.	Plymouth	2 p.m., June	6.. Constructing three township roads.....	O. H. Weber, Co. Auditor.
Ind.	Noblesville	10 a.m., June	6.. Constructing 8 roads.....	W. O. Horton, Co. Auditor.
Wash.	South Bend	June	6.. One mile concrete pavement, retaining wall, 1 1/2 miles grading and draining.....	C. B. Nims, Co. Engineer.
Ind.	Valparaiso	2 p.m., June	6.. Constructing 3 1/2 miles gravel road.....	C. A. Blachly, Co. Auditor.
Ind.	Bloomington	2 p.m., June	6.. Constructing 4 roads.....	W. F. Kinser, Co. Auditor.
Ind.	Huntington	10 a.m., June	6.. Road construction.....	O. E. Eviston, Co. Auditor.
Ind.	Goshen	1:30 p.m., June	6.. Constructing two brick roads.....	A. R. Bemenderfer Co. Aud.
Ind.	Vincennes	2 p.m., June	6.. 75,000 sq. yds. concrete pavement; cost \$130,000.....	W. H. Reel, Co. Surveyor.
Pa.	New Wilmington	June	6.. 21,900 sq. yds. brick pavem't and 14,900 ft. curb.....	T. A. Gilkey, Engineer, Mercantile Bldg., N. Castle, Pa.
S. D.	Clear Lake	2 p.m., June	6.. Grading 2 roads; constructing concrete arches.....	J. M. Wold, County Aud.
N. C.	Shelby	June	6.. 26,232 sq. yds. p.v'm't, 5,000 ft. curb and 900 ft. con. header.....	J. B. McCrary Co., Atlanta, Ga.
Tenn.	Madisonville	June	6.. Grading 70 miles and surf. 90 miles; \$325,000 available.....	R. J. Love, Engineer.
Ind.	Martinsville	1:30 p.m., June	6.. Constructing township roads.....	S. Watson, County Aud.
Mont.	Billings	June	6.. 10,000 sq. yds. of paving.....	E. M. Sneckenberger, City Engr.
Neb.	Papillion	noon, June	6.. Constructing concrete walks and culverts during 1916.....	G. F. Oliver, Village Clerk.
Cal.	Stockton	10 a.m., June	6.. Improving 2.5 miles of road.....	E. D. Graham, Clk., Co. Supvrs.
Miss.	Bolton	noon, June	6.. 2 1/2 miles roads and streets.....	C. M. Farr, Sec'y Hwy. Com.
Miss.	Vicksburg	noon, June	6.. Raising road.....	J. D. Laughlin, Warren Co. Chancery Clerk.
N. Y.	East Syracuse	8 p.m., June	6.. Concrete curb and gutter.....	J. Elmer Osborn, Vil. Clerk.
Wis.	New London	8 p.m., June	6.. Cement walks.....	C. J. Thompson, City Clerk.
Minn.	Buffalo	1 p.m., June	6.. Grading state roads.....	John A. Berg, Wright County Aud.
O.	Euclid	noon, June	6.. Grading, curbing and paving sidewalks.....	H. S. Dunlop, Village Clerk.
N. D.	Fargo	noon, June	6.. Road improvements.....	W. R. Tucker, Cass Co. Aud.
N. D.	Bismarck	June	7.. Road construction.....	Burleigh Co. Surveyor.
Miss.	Brookville	2 p.m., June	7.. Rock roads.....	J. A. Tysen, Chancery Clerk, Macon, Miss.
Miss.	Macon	June	7.. Constructing stone roads.....	J. A. Tyson, Chancery Clerk.
Mich.	Ann Arbor	June	7.. 11,000 to 14,000 sq. yds. brick pavement.....	Manly Osgood, City Engineer.
Ind.	Warsaw	10 a.m., June	7.. Constructing gravel road.....	V. D. Mock, County Auditor.
O.	Cedarville	noon, June	7.. 4,000 sq. yds. paving.....	J. W. Johnson, Village Clerk.
Ind.	Columbia City	10 a.m., June	7.. Constructing stone roads.....	T. A. McLaughlin, Co. Aud.
Ill.	Morrison	June	7.. 26,803 sq. yds. brick on macadam base.....	V. N. Taggett, Co. Hwy. Supt.
Ind.	Shelbyville	10 a.m., June	7.. 3 miles crushed stone road.....	F. W. Fagel, Co. Auditor.
Ind.	Peru	noon, June	7.. Improving with concrete.....	
N. Y.	Albany	1 p.m., June	7.. Constructing and repairing state highways.....	Edwin Duffey, State Highway Commissioner.
Wash.	Sultan	June	7.. 7,500 sq. yds. paving.....	W. F. Leaville, City Clerk
Fla.	Palatka	June	7.. Two miles of brick paving.....	County Comrs.
Ind.	Lafayette	10 a.m., June	7.. Grading, curbing and paving roads.....	G. W. Baxter, Co. Aud.
N. J.	Cranford	8:30 p.m., June	7.. 90-ft. retaining wall; 280 ft. concrete curbs and gutters.....	Edward Mosher, Twp. Engr.
Pa.	Harrisburg	noon, June	7.. 400 tons asphaltic cement.....	W. H. Lynch, Supt. of Streets.
N. Y.	Brooklyn	11 a.m., June	7.. Regulating and paving with asphalt.....	Boro Pres., L. H. Pounds
N. Y.	L. I. City	11 a.m., June	7.. Laying sidewalk, grading and setting curb.....	M. E. Connolly, Boro. Pres.
Ky.	Ludlow	8 p.m., June	8.. Improving highway with brick, bitulithic or gran. block.....	W. B. Cullen, City Clerk.
Ind.	New Albany	10 a.m., June	8.. One mile of road.....	County Auditor.
Ind.	Madison	7 p.m., June	8.. Brick, asphalt, wood block or concrete, 19,700 sq. yds. on 5 to 8-in. concrete foundation.....	R. F. Lee, City Engineer.
O.	Middletown	noon, June	8.. Grading street.....	John Kunz, Clerk, City Com.
Fla.	Tallahassee	June	8.. 33 miles sand-clay road and 91,000 cu. yds. excavation.....	J. C. Moore, Chairman, County Commissioners.
Okl.	Kiefer	noon, June	8.. 20 miles macadam road, including 60,000 cu. yds. exca- vation and embankment, cost \$94,000.....	P. J. Tuttle, Township Clerk
Col.	Glenwood Sp'gs.	noon, June	8.. Constructing 4 1/2 miles of road.....	C. L. Hubbard, Co. Clerk.
Cal.	Bakersfield	June	8.. Grading and paving with concrete.....	F. E. Smith, Clk. Bd. of Supvs.
Ind.	Indianapolis	10 a.m., June	8.. Grading, curbing and paving and improving road.....	Leo. K. Fesler, Co. Aud.
Ind.	Crown Point	1 p.m., June	8.. Gravel roads.....	Edw. Simon, Lake Co. Aud.
O.	Cincinnati	noon, June	9.. 6,622 ft. road improvement.....	County Surveyor.
Fla.	Sanford	June	10.. 130,000 sq. yds. brick pav't, bridges and curbs.....	G. R. Ramsey, Engineer, Or- lando, Fla.
Kansas	Wichita	June	10.. Paving several streets, cost \$25,000.....	B. C. Wells, City Engr.
O.	Zanesville	June	10.. 2,000 yds. brick pavement, cost \$4,200.....	C. R. Spencer, City Engr.
Ind.	Richmond	11 a.m., June	10.. 24,000 gals. of road oil.....	L. S. Bowman, Co. Auditor.
la.	Estherville	June	11.. Grading 21 miles of road.....	C. P. Smith, Co. Engineer.
N. D.	Oakes	2 p.m., June	12.. Grading several roads.....	W. W. Denning, Clk Twp. Bd.
Va.	Rustburg	June	12.. 24 miles bituminous macadam and 9 miles waterbound macadam road.....	G. P. Coleman, St. Hwy. Comr. Richmond, Va.
W. Va.	Kingwood	1 p.m., June	12.. Grading and surfacing 50 miles of road.....	E. C. Everly, Clk. Co. Court.
N. J.	Camden	11 a.m., June	12.. Furnishing 3/4 and 1 1/2-inch broken stone.....	F. W. George, Clerk.
N. J.	Millburn	8 p.m., June	12.. Paving several streets.....	M. R. Silance, Township Clk.
Wash.	Olympia	2 p.m., June	12.. Surfacing with gravel or shale 6.8 miles highway.....	Jas. Allen, Sec. St. Hwy. Bd.
Ind.	South Bend	11 a.m., June	12.. Road construction.....	A. F. Wolf, County Auditor.
Mo.	St. Charles	June	12.. 5,800 ft. telford road.....	Alfred Riske, Co. Hwy. Engr.
La.	New Orleans	noon, June	12.. 65 miles gravel road, 12 miles earth road.....	W. E. Atkinson, State High- way Engineer.
O.	Cuyahoga Falls	noon, June	12.. Grading, draining, paving and curbing.....	W. K. Taylor, Mayor.
N. J.	P'th Amboy	2:30 p.m., June	12.. 34,000 sq. yds. asphalt block on concrete foundation.....	Alvin D. Fox, Co. Engr.
Ind.	South Bend	10 a.m., June	13.. Paving several streets; graveling.....	Veronica Sweeney, Clerk, Bd. Pub. Wks.



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STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
Mo., St. Louis	.....	Noon, June 13	Improving 9 streets	E. R. Kinsey, Pres. Bd. Pub. Serv.
N. Y., New York	.....	11 a.m., June 13	Two concrete and brick buildings and 820 yds. of brick pavements	Board of Water Supply.
Pa., Harrisburg	.....	10 a.m., June 13	Constructing reinforced concrete, brick and bituminous pavements	J. W. Hunter, First Deputy State Highway Comr.
N. C., Dunn	.....	5 p.m., June 13	17,000 sq. yds. brick, asph., bitulithic or oth. n't, 3,000 ft. concr. curb and gut. and 1,000 sq. yds. of sidewalk	G. C. White, Engineer, Durham, N. C.
Wis., Janesville	.....	2 p.m., June 13	14,458 sq. yds. asphalt macadam and 3,000 cu. yds. excavation	City Clerk.
O., Eaton	.....	June 14	Laying 40,000 sq. yds. paving	A. L. Reid, Village Engineer.
Mo., Carthage	.....	June 15	12,000 sq. yds. asphalt macadam	F. B. Newton, City Engr.
O., Greenfield	.....	June 15	Paving with brick and macadam, cost \$25,000	E. M. Connor, City Clerk.
O., Zanesville	.....	June 15	13,000 yds. brick pavement and 1,300 yds. concrete pavement, curbs and gutters	C. R. Spencer, City Engr.
Cal., Fowler	.....	June 15	13,000 sq. yds. pavement, cost \$10,000	C. P. Jensen, City Engr.
Ind., Logansport	.....	10 a.m., June 15	Improving streets	Bd. Public Works.
Pa., Harrisburg	.....	June 16	Constructing state highways	State Highway Dept.
Ind., Franklin	.....	10 a.m., June 16	Constructing gravel road	J. C. Gregg, Co. Aud.
N. Y., Dolgeville	.....	8 p.m., June 17	Improving two streets	W. H. Bacon, Village Clerk.
Ind., Lafayette	.....	10 a.m., June 17	Grading, curbing and paving roads	G. W. Baxter, County Aud.
Wis., Oshkosh	.....	10 a.m., June 17	Constructing macadam road	Geo. H. Randall, City Engr.
O., Eastview	.....	noon, June 19	Paving, curbing and improving streets	F. A. Pease Eng'g Co., Marshall Bldg., Cleveland, O.
N. D., Minot	.....	June 19	25,000 sq. yds. pavement, cost \$85,000	E. J. Thomas, City Engr.
Pa., Cresson	.....	8 p.m., June 19	18,200 sq. yds. brick or concrete pavement and 10,700 ft. curbing	D. W. Dillman, Engr., Altoona Trust Bldg., Altoona, Pa.
Wis., Rockville Center	.....	June 20	Constructing concrete roads	Village Clerk
Ala., Vernon	.....	June 21	Grading and graveling 11 miles	County Comrs.
Miss., Charleston	.....	June 21	Constructing 1 1/2 miles road	County Supervisors.
Fla., Sebring	.....	June 21	48,000 sq. yds. of pavement; \$56,000 available	Jaudon Engineering Co., Savannah, Ga., & Bartow, Fla.
Ind., Indianapolis	.....	10 a.m., June 25	Reconstructing two roads	L. K. Fesler, Co. Auditor.
Utah, Salt Lake City	.....	June 27	Concrete and asphalt paving	S. Q. Cannon, City Engr.
Tenn., Jackson	.....	10 a.m., June 27	54,000 sq. yds. brick pavement	Hu. M. Harris, Comr. of Sts.
W. Va., New Martinsville	.....	June 29	Constructing 15 miles of road	J. R. Wilson, Engr., Mannington, W. Va.
Ala., Bay Minette	.....	July 1	Constructing county highways	J. M. Garrett, Co. Engr.
Ala., Mobile	.....	July 1	Constructing Delta highway	County Rd. Comrs.
O., Maumee	.....	July 1	20,000 sq. yds. of paving	T. N. Dowling, City Clerk
Miss., Greenwood	.....	noon, July 3	Surfacing 100 to 140 miles roads	A. R. Bew, Clerk, Co. Supvrs.
La., Terrebonne	.....	noon, July 5	Constructing 11.7 miles sand-clay-gravel roads	T. B. Smith, Eng., Houma, La.
Miss., Greenwood	.....	July 10	100 to 140 miles hard surface road; \$600,000 available	County Supervisors.
Tex., Caldwell	.....	July 10	Sand clay roads; \$20,000 available	C. H. Maljowsky, Engineer.
SEWERAGE.				
S. D., Mitchell	.....	8 p.m., June 5	3,500 ft. 8 and 10-in. sewers	Thos. Eastcott, City Aud.
Minn., New Ulm	.....	June 5	Ditch construction, 6 to 14-in. tile; cost \$5,250	F. D. Minium, Engineer.
N. D., Grand Forks	.....	4 p.m., June 5	Constructing lateral sewer	W. H. Alexander, City Clerk.
La., Bedford	.....	7:30 p.m., June 5	Sewers in two streets	J. K. Jones, City Clerk.
Mich., Menominee	.....	June 5	Constructing sewers	F. S. Norcross, City Clerk.
Kan., Neodesha	.....	June 5	Constr. intercepting sewer and sewage disposal works	City Clerk.
Mich., E. G'd R'p'ds.	.....	7:30 p.m., June 5	3-in. sanitary sewer	H. P. Hugenholtz, Vill. Clerk.
O., Euclid	.....	noon, June 6	Sewers	H. S. Dunlop, Village Clerk.
Ind., Logansport	.....	June 6	12 miles 6 to 60-in. segment block and vit. pipe sewer	H. H. Thompson.
N. Y., Dunkirk	.....	8 p.m., June 6	8-in. tile sewer	A. D. Toomey, City Clerk.
Conn., Wilson	.....	7:30 p.m., June 6	Constr. of 10,000 ft. of 8-in. to 18-in. vit. tile sewers	H. R. Turner, Civil Engineer, Windsor, Conn.
O., Alliance	.....	noon, June 6	Improving sewage treatment plant	City Engineer.
N. J., Paterson	.....	June 6	Sewers in several streets	Board Public Works
N. D., Point Pleasant	.....	June 6	Extending sewer system, cost \$21,000	R. W. Morris, Engr.
N. C., Shelby	.....	June 6	2 miles of sewers; cost \$7,000	J. B. McCrary Co., Atlanta, Ga.
N. J., Point Pleasant	.....	June 6	Sewer construction to cost \$21,000	Boro. Clerk.
N. J., Newark	.....	June 6	Constructing section No. 22, Passaic Valley sewer	Passaic Val. Sew'ge Com.
Tenn., Johnson City	.....	7:30 p.m., June 6	6,450 ft. 6 to 12-in. sewers and 9 manholes	P. F. McDonald, City Engr.
Miss., Tchula	.....	June 6	Constructing sewer system	W. W. Gwin, Mayor.
O., Cedarville	.....	noon, June 7	4,000 sq. yds. pavement and 4,000 ft. of drain tile	J. P. Shumaker, Engineer, Xenia, O.
N. Y., Brooklyn	.....	11 a.m., June 7	Constructing sewers and pumping station	Bureau of Sewers.
O., Dayton	.....	noon, June 7	4,700 ft. 9-ft. storm sewer and appurtenances	J. E. Barlow, Dir. Pub. Serv.
La., Waverly	.....	5 p.m., June 7	Sanitary sewers	H. R. Vanderveer, City Clerk.
O., Cleveland	.....	June 8	Constructing two sewers	Comr. of Engineering
Wis., Milwaukee	.....	June 8	Extensions to intercepting sewer system	T. C. Hatton, Ch. Engr.
Fla., Tallahassee	.....	10 a.m., June 8	Constructing drains	J. W. Jones, Co. Engr.
Ill., Chicago	.....	noon, June 8	Constructing Calumet intercepting sewer	Trustees, San. Dist., Room 700, 910 S. Michigan Avenue.
Kan., Lincoln Cen.	.....	7:30 p.m., June 8	10 1/2 miles 8, 10 and 12-in. vit. sew. pipe and septic tank	C. H. Berry, City Clerk.
Minn., Blue Earth	.....	10 a.m., June 9	Digging and constructing ditches	Jesse L. Herring, Faribault, County Auditor.
Neb., Alnsworth	.....	June 9	Constructing sewerage system	Fred Jay, City Clerk
N. J., Montclair	.....	June 12	Constructing storm sewers	E. S. Closson, City Engr.
Ind., South Bend	.....	10 a.m., June 13	Constructing pipe sewers and sewer connections	Veronica Sweeney, Clerk Bd. Pub. Wks.
La., Clinton	.....	8 p.m., June 13	Sewer	City Clerk.
Okla., Afton	.....	8 p.m., June 14	Main sewers, including 2,990 ft. 15-in. pipe, 2,510 ft. 12-in. pipe, 3,576 ft. 10-in. pipe, 1 flush tank and sewage purification plant; laterals sewers, including 5,115 ft. 10-in., 11,130 ft. 8-in.	City Trustees.
Ky., Lexington	.....	June 15	Constructing main outfall sewer	J. White Guyn, City Engr.
Va., Richmond	.....	June 15	5,200 ft. concrete sewer	C. E. Bolling, City Engr.
Wash., Oaksdale	.....	June 15	2 1/2 miles sewers, tank and filter beds, cost \$18,000	Sawyer Bros., Engrs., Lindelle Block, Spokane, Wash.
N. J., Lodl	.....	June 15	Constructing sewer system and disposal plant	Bowe and Wessels, Engineers, Rutherford, N. J.
Wash., Oakesdale	.....	June 15	2 1/2 miles sewer and disposal plant; cost \$18,000	City Clerk.
O., Zanesville	.....	June 15	500 feet 5 to 15-inch sewer	C. R. Spencer, City Engineer.
Arizona, Oatman	.....	June 15	Water and sewer systems, estimated cost \$250,000	C. L. Mayhew, Sec. Mohave-Oatman Water Co.
O., Xenia	.....	June 15	Constructing storm sewers, cost \$35,000	J. P. Shumaker, City Engineer.
Miss., McComb City	.....	June 20	Constructing sewer system, \$90,000 available	City Clerk.
Minn., Benson	.....	July 1	48 miles drainage ditch; 250 miles 6 to 30-in. tile	F. B. Gardner, Engineer.
Ill., Salem	.....	July 15	Sewer system and disposal plant, cost \$50,000	City Clerk.

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STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
WATER SUPPLY				
Tex., El Paso	June	3..	Electrically operated pumping equipment.....	Depot Quartermaster, Ft. Bliss
O., Farmersville	June	3..	Constructing water works system.....	A. F. Gilbert, Clk. of Trstes.
D. C., Washington	June	5..	Furnishing sheet lead, lead pipes, etc.....	Gen. Pur. Officer, Pan. Canal.
Wash., Everett	June	5..	28 miles of flow line, 2 river crossings, rock-fill dam and other improvements; estimated cost \$600,000.....	Burns & McDonnell, Engrs., Interstate Bldg., Kan. City, Mo.
N. J., Perth Amboy	8.30 p.m., June	5..	Installing oil supply pipe line, water and steam line, etc.....	Runyon & Carey, Engrs., 845 Broad St., Newark.
Neb., Platte Center	10 a.m., June	5..	Extending water mains .....	S. B. Allen, Village Clerk.
Wis., East Troy	7 p.m., June	5..	Laying 2,000 ft. 4-in. pipe and 5 hydrants.....	O. R. Kurzrok, Village Clk.
Ind., Hartford City	2 p.m., June	5..	Water system at County Infirmary.....	J. L. McGeath, Co. Auditor.
Minn., St. Paul	10:30 a.m., June	5..	Furnishing c. i. pipe, valves, Venturi meter, and erecting reservoir complete .....	Aug. Hohenstein, Pur. Agent.
Mich., Crystal Falls	8 p.m., June	5..	Laying pipe for distribution system.....	W. J. Gribble, City Clerk.
O., Cleveland	noon, June	5..	Laying 6-in. water mains at Cleveland Heights.....	F. A. Pease Engineering Co., Marshall Building.
Ind., Laporte	9 a.m., June	5..	Threaded pipe and fittings.....	W. F. Krueger, City Clerk.
O., Euclid	noon, June	6..	Water mains .....	H. S. Dunlop, City Clerk.
Miss., Tchula	June	6..	Constructing wells, mains, water tower or tanks.....	W. W. Gwin, Mayor.
Conn., Waterbury	8 p.m., June	6..	Laying watermains in several streets.....	R. A. Cairns, City Engineer.
Conn., Hartford	June	6..	Building concrete steel conduit.....	Bd. Contract & Supply
N. J., New Brunswick	June	6..	Three motor-driven pumps .....	Asher Atkinson, City Engr.
O., Cleveland	noon, June	8..	Laying steam and water pipes.....	Deputy Commr. of Water
Wis., Whitewater	June	9..	Drilling 364 ft. of wells in rock (8 to 15 in.).....	A. N. Savel, Sec. W. Comm.
Wis., Sheboygan Falls	June	10..	Water works system to cost \$35,000.....	F. R. Roeyer, City Clerk
Ind., LaPorte	2 p.m., June	12..	Reinforced conc. reservoir, involving 900 cu. yds. of conc. and 200,000 lbs. of steel reinforcing bars.....	L. Drew Goddard, City Engr.
Minn., St. Paul	10:30 a.m., June	12..	Furnishing two rotary screens.....	August Hohenstein, Pur. Agt.
Ind., South Bend	10 a.m., June	13..	Water and sewer connections.....	Veronica Sweeney, Clerk Bd. Pub. Wks.
Va., Richmond	noon, June	15..	Aluminum sulphate .....	E. E. Davis, Supt. of W. W.
Tex., Port Arthur	2 p.m., June	15..	Equipment for pumping plant .....	J. F. Coleman, Engineer, Hi-bernia Bldg., New Orleans, La.
Arizona, Oatman	June	15..	Installing water and sewer systems, cost \$250,000.....	C. L. Mayhew, Sec. Mohave-Oatman Water Company.
N. J., Trenton	2 p.m., June	16..	Addition to water system at State Hospital; extending fire services .....	Bd. of Managers, N. J. State Hospital.
Nev., Winnemucca	June	17..	21,000 ft. 4 to 8-in. clay pipe, 73,000 ft. 8-in. and 28,000 ft. 12-in. wood or steel pipe with valves and gates for water works system .....	J. W. Davey, Clk. Co. Comrs.
La., New Orleans	noon, July	18..	Riveted steel pipe for drainage system.....	G. G. Earl, Supt. W. & Sewerage Board.
MISCELLANEOUS.				
D. C., Washington	June	3..	One-ton bucket dredge.....	Bureau of Yards and Docks, Navy Dept.
Miss., Yazoo City	noon, June	5..	Auto truck .....	F. F. Griffin, Clerk Supvrs.
Ind., Monticello	10 a.m., June	6..	Bridges over drainage ditches.....	A. G. Fisher, Co. Auditor.
N. J., Orange	June	6..	Collection and disposal of garbage.....	City Commission.
S. D., Highmore	June	6..	One elevator grader .....	L. W. Carter, Co. Auditor.
Ind., Muncie	10 a.m., June	7..	Cleaning and repairing two ditches.....	S. C. Hermann, Twship Trustee
N. J., Atlantic City	3 p.m., June	8..	Bulkheads at street ends.....	J. W. Hackney, City Engr.
N. Y., Tompkinsville	June	8..	Furnishing and placing 1,000 tons of rip rap.....	Lighthouse Inspector.
Ind., Muncie	1 p.m., June	13..	Cleaning and repairing ditches.....	Goly Snider, Twp. Trustee.
Ore., Hermiston	June	15..	Canal work, including 168,000 cu. yds. excavation.....	U. S. Reclamation Service.
Ill., Belleville	June	15..	Improving creek, cost \$79,600.....	W. C. Wolf, City Engineer.
Utah, Provo	June	15..	Constructing canal .....	U. S. Reclamation Service.
Conn., Bridgeport	Noon, June	19..	Constructing 3,900 ft. sea wall .....	A. H. Terry, City Engr.
Mont., Malta	2 p.m., June	22..	Canal work, including 124,000 cu. yds. excavation.....	U. S. Reclamation Service.
Texas, Balmorhea	2 p.m., June	24..	Constructing of diverging dam and canal, two earth storage dams with outlet work and canals.....	V. L. Sullivan, Ch. Engineer, Reeves Co. Irrig. Dist. No. 1.
Va., Clintwood	June	26..	Two steel bridges.....	W. E. French, Co. Engineer.
Siam, Bangkok	Aug.	1..	Furnishing suction or hydraulic dredge.....	Director General, Royal Irrigation Dept.

## STREETS AND ROADS

**Gadsden, Ala.**—Council has authorized purchase of white truck, scraper and trailers. Truck will cost \$5,000 and will be used for street work.

**Phoenix, Ariz.**—Resolution has been approved for improvement of Fourth St. by paving, curbing and guttering. Frank Thomas is City Clerk.

**Phoenix, Ariz.**—Protest of property owners on Second Ave. between Van Buren and Fillmore Sts. against 46-ft. paving and asking for paving to full width of 68 ft., was approved by commission and full width paving ordered.

**East Sacramento, Cal.**—Petitions will be placed in circulation for paving on 33d, Elm, McIntyre, Crandall, 34th Sts. and Cherry Ave. Petition will ask for improvement under 10-year bonding act.

**Los Angeles, Cal.**—Resolution has been adopted by council approving specifications calling for construction of Warrenite pavement on concrete base on Rosewood Ave. Chas. L. Wilde is City Clerk.

**Santa Ana, Cal.**—Plans are being discussed for paving Orange Ave. with asphalt or crushed rock and oil.

**Santa Ana, Cal.**—Preparations are being made to pave the mile strip north from Coyote creek bridge on north side of Los Alamitos.

**San Diego, Cal.**—City Engineer Cromwell has started survey for new road from Old Town across mesa to connect with Murray Canyon Rd. on opposite side of Mission Valley.

**Stockton, Cal.**—Plans have been prepared for paving Miner Ave. a distance of 17 ft. on each side of the street with asphalt macadam on concrete base.

**Georgetown, Del.**—Proposition to lay concrete roadway from one end of Market St. to the other will be voted on shortly. If proposition meets with favor it is understood that some capitalists of Georgetown will loan money to defray expenses of work until next session of the Legislature, when bill will be presented to bond town to cover cost of improvement. It is figured that work can be completed for about \$10,000.

**Jacksonville, Fla.**—Citizens of Polk county will vote June 1 on proposed bond issue of \$1,500,000 to cover proposed system of hard surfaced roads through the county.

**Pensacola, Fla.**—Walton county is preparing to vote upon an issue of \$200,000 of 5 per cent. bonds for road and bridge improvement.

**Atlanta, Ga.**—The paving contemplated on West Peachtree Ave. in the ordinance consists of granite and bitulithic from Baker St. to North Ave., and wood blocks from North Ave. to 6th St. Original ordinance provided that street car

company lay and guarantee to maintain concrete base for paving between its tracks throughout entire course, except on the fill between Baker and Pine Sts. This the company objected to, and offered as a substitute to that provision that it would guarantee for all time the maintenance of the surface paving between its tracks. Committee has accepted proposal and council will act shortly.

**De Kalb, Ill.**—City will be ready about June 1 to receive bids on 14,000 yards brick and 3,000 yards concrete pavement with concrete curb covering four streets. Work will be paid for in special assessment bonds. A. R. Russell is Public Engineer.

**Freeport, Ill.**—No bids were received for constructing following roads in McHenry county and new advertisements will be issued. Section G, 10,500 feet of gravel road out of Woodstock; engineer's estimate of cost, \$11,791. Section H, 10,500 feet out of Hartland; engineer's estimate of cost, \$11,811.

**Freeport, Ill.**—Macadamizing of several streets in Second Ward was agreed to at recent meeting of property owners and board of public improvements. Cost as estimated by Charles S. Hepner, city engineer, is \$11,747. These streets will be improved: Chestnut, from Locust to West; American, from Locust to



Pine; Pine, from Homer to American. Macadam is to be of a width of 30 ft.

**Ottawa, Ill.**—City will call for bids to be received June 9th for sweeping paved streets of city for coming year.

**Quincy, Ill.**—Work of revising plans for improvement of roads of Adams county if county votes to issue bonds to build highways is now being done by County Superintendent of Highways, L. L. Boyer. In many places where macadam was specified in first set of plans, gravel will be used.

**Evansville, Ind.**—Construction of asphalt road 5 miles long in Union twp. is being planned.

**Huntington, Ind.**—Petition has been filed with city clerk, asking board of works to order modern pavement on Arthur St. Petition for a similar pavement on Wesley St. is being circulated.

**Huntington, Ind.**—Miller & Co. of Indianapolis bought \$54,100 worth of gravel road bonds from A. H. Shaffer, county treasurer. Bonds were for the I. M. Jackson, Kilty, Lewis and Kress roads, respectively. Amounts were \$11,400, \$11,200, \$9,140 and \$22,360. Premiums paid were \$165, \$150, \$125 and \$325.

**Kokomo, Ind.**—Howard National Bank got two issues of road bonds that were sold by Ora J. Davies, county treasurer. The Hercules bonds of \$3,600 were sold for par, \$46 premium and accrued interest and the Matlock bonds brought the face of \$12,000 with \$156 premium and accrued interest. Besides these two sets the Locke bonds for a road in Howard township were sold for face, \$5,280, \$65 premium and accrued interest.

**Laporte, Ind.**—American Mortgage and Guarantee Co. of Indianapolis is successful bidder on \$4,000 worth of Louis Martine road bonds. This company's bid was \$4,058. Other bids were: J. F. Wild & Co., Indianapolis, \$4,041; Gavin L. Payne & Co., Indianapolis, \$4,036; Breed, Elliott & Harrison, Indianapolis, \$4,036; Fletcher-American National Bank, Indianapolis, \$4,043.50; Merchants' National Bank of Muncie, \$4,041.85.

**Shelbyville, Ind.**—County Treasurer Scott A. Brown sold a 10-year 4½ per cent road improvement bond issue of \$7,760 to Mrs. Edith L. Davis, of this city, on premium bid of \$136.13. It is for improvement of William H. Valentine Rd., in Van Buren township. Other bidders and their bids follow: Delaware County National Bank, \$110.50; Breed, Elliott & Harrison, \$101.50; Dick Miller, \$100; J. F. Wild & Co., \$91.

**Richmond, Ind.**—At least \$200,000 in road construction is being contemplated by county commissioners this year as result of petitions being presented, demanding that commissioners construct approximately 20 miles of road under 3-mile road law.

**South Bend, Ind.**—Board has adopted resolution calling for resurfacing of Lincoln Highway from Church to West Sts.

**Tipton, Ind.**—City council has granted petition for new street across Lake Erie & Western railroad to connect Dearborn and Mound Sts. The railroad remonstrated.

**Muscatine, Ia.**—City Engineer will advertise shortly for bids for paving. Plans for \$145,000 paving project have been already approved by council.

**Muscatine, Ia.**—Council will order construction of sidewalks on several streets.

**Clay City, Ky.**—Good Roads Association has been formed here to look after expenditure of money appropriated to use of western end of Powell county. Sum of \$20,000 of \$40,000 bonds recently voted will be spent near Clay City, and association will advise with Fiscal Court in selection of roads to be improved and kind of roads desired by citizens here.

**Hopkinsville, Ky.**—Christian County road commission has arranged with local banks to furnish money to prosecute extensive road building campaign in this county this year, for which \$400,000 worth of bonds have been voted, which, owing to unsettled financial conditions, have not yet been sold. As Fiscal Court was unwilling to let them go for small premiums that have been offered, Plans have been approved by road commission here for improvement of five of the most important intercounty seat roads, and as soon as these plans have been approved by state road department contracts will be let.

**Owensboro, Ky.**—Contract awarded to Seasongood & Mayer of Cincinnati for road and bridge bond issue of \$600,000 for Daviess County at par, accrued interest and premium of \$4,200. It is planned to construct about 75 miles of

rock roads and contracts will be let immediately.

**Paducah, Ky.**—Bond issue of \$300,000 is being discussed for good roads.

**Shelbyville, Ky.**—Council has ordered construction of sidewalks on several streets.

**Versailles, Ky.**—Woodford Fiscal Court has instructed County Road Engineer to have section of Frankfort turnpike beyond city limits of Versailles surfaced with asphalt.

**Winchester, Ky.**—Movement is on foot in Powell County to raise funds for building road from Lullygrud to Clay City.

**Agawam, Mass.**—Town has voted to appropriate \$8,000 for macadamizing Meadow Street.

**Attleboro, Mass.**—Highway will be built between this town and Norton at cost of about \$35,000. State Engineer Sawyer acted for commission in agreeing that town should have charge of work. Contract is to be sub-let to Contractor Rourke who built Barrowsville road for Norton.

**Beverly, Mass.**—Movement is on foot for installing sidewalk on Elliott St.

**Boston, Mass.**—Governor McCall has signed bill authorizing State Highway Commission to expend \$200,000 for purpose of constructing State boulevard in city of Revere near Revere beach blvd.

**Boston, Mass.**—Public Works Department has made plans for resurfacing Albany St., Haymarket Sq. and large portions of Washington St., Canal St., Endicott, Cross and several other streets in the vicinity of North Station. Public Works Department could not handle more than \$500,000 for street work during year, and if Mayor approves plan of department much of this money will be devoted to streets named.

**Haverhill, Mass.**—Council considering orders for macadam work as follows: Cedar St., from White to Eleventh Ave., to cost \$5,000; Eleventh Ave. from Cedar St. to Main St., to cost \$1,500; Kenosha Ave. from Main St. to Concord St., to cost \$9,350; Main St. east side, from Kenosha Ave. northerly, to cost \$8,500; Water St., from Groveland St. to Lincoln Ave., to cost \$5,500; Lincoln Ave., from Water St. to Groveland St., to cost \$3,000; Church St., Bradford district, from Main St. to Salem St., to cost \$1,500; and Main St., Bradford district, from Laurel Ave. westerly, to cost \$5,500. An order was passed that Fifteenth Ave. be constructed from Primrose St. to Cedar St., to cost \$1,500.

**Pittsfield, Mass.**—See "Water Supply."

**Pittsfield, Mass.**—Hearing ordered for June 12 on proposed laying out of Jordan Ave. as a city way.

**Saugus, Mass.**—Town will vote June 5 on appropriations of \$30,000 for permanent roads and \$6,000 for highway, bridges and equipment.

**Springfield, Mass.**—Appropriation of \$30,000 has been made for street paving.

**Waltham, Mass.**—Orders for rebuilding Main from Willow St. to Watertown line at cost of \$10,000, and Moody St. from Hall's corner to Newton line at cost of \$15,000, have been approved by Aldermanic Committee on Finance.

**Waltham, Mass.**—Ordinances adopted appropriating \$15,000 for rebuilding Moody St. and \$10,000 for rebuilding Main St.

**Duluth, Minn.**—Members of state highway commission have been deluged with petitions from residents of Stearns and Todd counties to route Jefferson Highway through their borders and through Wadena, Hubbard and Beltrami counties as well by way of St. Cloud and Sauk Center.

**Duluth, Minn.**—Council ordered paving of 11th Ave east, from 2d to 11th St., and laying of sewer in Piedmont Ave., from Forest Ave. to Bay View Terrace. A one-course concrete pavement in 11th Ave. will cost \$26,700, according to estimates prepared by city engineer.

**Minneapolis, Minn.**—Street improvements involving concrete paving of six arterial streets to city limits are recommended in report of Minneapolis real estate board. Committee states that two miles of additional pavement is needed on Cedar Av., four miles on Portland Ave., two miles on Upton Ave., 1½ miles on Nicollet, a half mile on Lyndale Ave. N., and two miles on 44th Ave. and Osseo Rd.

**Minneapolis, Minn.**—An annual paving expenditure of \$1,000,000 by city is being urged by members of Twenty-

sixth St. Improvement Association. Not more than \$800,000 can be spent this year, Platt B. Walker, president of city council, told association.

**St. Paul, Minn.**—Council has approved resolutions fixing grade on several streets.

**Kansas City, Mo.**—See "Miscellaneous."

**Liberty, Mo.**—Election will be held June 24 to vote on 1½ million dollar bond issue for building 202-mile system of oiled and macadam highways in Clay County.

**Butte, Mont.**—Petitions are being circulated for paving on Park St. and Broadway. Proposed paving will make total of 7 miles of new paving in Butte to be done during next four months. Cost will be about \$500,000.

**Nebraska City, Neb.**—Bond issue of \$30,000 for paving is contemplated.

**Elizabeth, N. J.**—Board will now proceed with plans for repaving Elizabeth Ave. from Broad St. to 7th St.; 1st St., South Broad, Marshall, Chilton, South, Mary and Elm Sts. City council already has appropriated \$297,469.35 for the work. Bids for work will probably be received June 22.

**Fairfield, N. J.**—Amos W. Harrison, county engineer, has been authorized to inspect Sand Rd., Fairfield, and to report to committee on advisability of acquiring it as a county road and making needed improvements.

**Keyport, N. J.**—Proposition to widen Broad St. has been discussed by council who passed ordinance. Hearing of property owners is set for June 12.

**Passaic, N. J.**—Resolution has been introduced instructing city clerk to advertise for proposals for resetting curb in Bloomfield Ave., between Grove St. and Van Houten Ave., excepting between Randolph and Richard Sts.

**Albany, N. Y.**—The \$150,000 item in general appropriation bill to be used by public service commission in abolishing grade crossings covers Court St. crossing. It was approved by governor.

**Batavia, N. Y.**—It was voted by Common Council to pave with brick and asphalt Elliott St. and Lincoln Ave.

**Binghamton, N. Y.**—Unless property owners on Robinson St. rescind petition asking for bitulithic pavement, and ask for concrete pavement instead, it is probable Council will authorize Board of Contract to reject all bids for paving that street and send project over until next year.

**Binghamton, N. Y.**—Proposition to bond village for \$3,500 to widen portion of county highway on Main St. and to macadamize Water and Whig Sts. was carried by a vote of 58 to 53.

**Buffalo, N. Y.**—Council has voted to pave south end of Broadway Market.

**Dunkirk, N. Y.**—Bids for paving Doughty St. rejected. New bids will be asked.

**Lockport, N. Y.**—Committee has been appointed by Mayor to act with Board of Supervisors relative to proposed improvement of Gooding St.

**Niagara Falls, N. Y.**—Assemblyman Parker reports that there is \$67,900 in state highway fund for improving of Niagara County highways. There is also available an appropriation of \$9,871 for improving of Lewiston Rd. from the Devil's Hole to top of Lewiston Hill. Work on this improvement will soon be started.

**Peekskill, N. Y.**—All bids for widening of Welcher Ave. were rejected and Clerk was ordered to advertise for bids again.

**Rochester, N. Y.**—Council will consider following ordinances: Howell St. asphalt pavement, \$21,000; Marshall St. asphalt pavement, \$26,000; Beach Ave. asphalt pavement, \$19,000.

**Rome, N. Y.**—City will advertise for bids for paving to be done on several streets.

**Rochester, N. Y.**—The Good Roads Committee of the Board of Supervisors will have submitted to them a list of new roads proposed by state for Monroe County, and if approved of by committee, appropriations for building same will undoubtedly be made when next meeting of the board is held. Largest road contract calls for 7.93 miles known as Sweden-Walker state road and will cost \$78,400. Next important road is the Scottsville-Rush state road, 5.27 miles in length, and will cost \$73,000. Churchville-Adams Basin state road, covering a distance of 6.33 miles, will cost \$65,300; Chili-Coldwater road will be 2.92 miles and will cost \$44,200; Rush-Mendon state road will be 3.69 miles in length and will cost \$38,000.





L. Dolan, \$3,400.00; Anthony Cefalo, \$4,654.50; Frank Drinkwater, \$4,737.50; V. Grande, \$5,082.50. Engineer's estimate, \$3,189.20. Shawmut Ave., Upton St., and Newland St., City proper: M. H. Kelly, \$1,186.40; Barrett, William & Co., \$1,355.00; Anthony Baruffaldi, \$1,537.00; Vincenzo Grandi, \$1,546.01; M. DeSisto, \$1,771.00. Rugby Road, Dorchester: \*Anthony Cefalo, \$844.00; John F. Corrigan, \$1,134.50; Louis Balboni, \$1,232.01; Frank Drinkwater, \$1,309.50; John Guarino & Son, \$1,309.84. Engineer's estimate, \$1,216.00. Willow Court, Dorchester: \*M. H. Loonie, \$1,196.00; M. H. Kelly, \$1,231.85; Timothy Coughlin, \$1,261.20; Vincenzo Grande, \$1,336; Engr.'s estimate, \$1,247; Perham St. & Outlet in Winslow St.; Vermont St. and Dent St. Brook Conduit, West Roxbury: Anthony Cefalo, \$11,738.25; Anthony Baruffaldi, \$12,672.50; Frank Drinkwater, \$13,706.50; M. DeSisto, \$13,828.25; John F. McCarthy, \$15,643.50; V. Grande, \$16,778.00.

**Fall River, Mass.**—Simpson Bros. Co., of Boston was only bidder for hassam pavement. Bids were as follows: compressed concrete, \$2.21 per square yard; block pavement, \$3.75; narrow blocks, \$5.20; hassam foundation for old granite block wearing surface, \$2.03; macadam pavement, \$2.32; bituminous pavement, \$1.30.

**Great Barrington, Mass.**—Contract for highway work on Monument mountain in Great Barrington will be awarded May 29 by commission. On this work state will pay \$20,000 and Great Barrington \$10,000 toward expenses and a dangerous curve will be eliminated at top of the mountain.

**Pittsfield, Mass.**—\*Texas Oil Co. for oiling state highways in western part of state.

**Aurora, Minn.**—\*Aurora Livery awarded contract to build 3 1-5 miles of Lampa road. Contract price is \$2,300 per mile for road work and 7 cts. per lin. ft. for drainage ditches.

**Duluth, Minn.**—Paving 21st Ave. east, from Superior to 4th St.: \*General Contracting Co. on its bid of \$11,527.58; paving 6th alley, from 11th to 12th Ave. east, \*J. Johnson on his bid of \$1,552.60; paving 56th alley, from Bristol to Ramsey St., \*Eklund & Iedberg on their bid of \$1,378.58, and laying sewer in Minnesota Ave., from Ninth to 12th St., \*Gillman-Murphy-Patterson Co., on their bid of \$1,463.

**Cape Girardeau, Mo.**—For improving and paving of North Fountain St. from Washington Ave. to Olive St., as follows: John Rouse—excavation, \$770; concrete paving, \$4,948; granitoid curbs, \$614; portland cement sidewalks, \$902.36; total, \$7,270.36. F. W. Keller—Excavation, \$980; concrete paving, \$4,984; granitoid curbs, \$737.04; portland cement sidewalks, \$1,127.70; total, \$7,828.74. \*Herman Loeffel—Excavation, \$616; concrete paving, \$4,928; granitoid curbs, \$706.33; portland cement sidewalks, \$1,104.93; total, \$7,265.26.

**Kansas City, Mo.**—\*E. F. Willcox for rocking the west two miles of Sin-a-Bar road at \$15,512. \*Jas. O'Connor & Son for rocking three-quarters of a mile extension of Woodland Ave. at \$7,207.

**Kansas City, Mo.**—For grading and macadamizing a 3-mile extension of the Hiler road to connect with the Buckner and Grain Valley roads, as follows: Robert A. O'Brien, \$48,016; Kansas Construction Co. (M. Ross), \$44,109; \*Davidson Construction Co., \$40,817. For macadamizing 5 miles of the Woods Chapel road between Lees Summit and Blue Springs: Davidson Construction Co., \$86,256; Robert A. O'Brien, \$74,264; \*Kansas Construction Co., \$73,952. Engineer's estimate was \$80,627.

**Sikeston, Mo.**—For 8,029 sq. yds asphalt macadam pavement on concrete base, 3,200 cu. yds. earth excavation: \*Murray & Williams, Sikeston & Wyatt, Mo., at \$13,823.22; L. W. Fitzpatrick, Frisco Bldg., St. Louis, Mo., at \$14,025.58. Earl J. Malone, Jr., is City Clerk.

**Fremont, Neb.**—\*Ford Paving Co. of Red Oak, Ia., for paving West Tenth St. at \$1.86 a sq. yd. His bid was 33 cts. for straight curb and 20 cts. for resetting old curb. Material will be three-inch vertical fiber brick with asphalt filler. Time for completing the work was set for Sept. 15. \*A. D. Sears of Fremont for paving Clarkson Ave. from Fifth to Tenth at \$1.39 a sq. yd. \*Roberts Construction Co. of Lincoln for installing curbing which will be 24-in. combination curb and gutter for 44 cts. a foot. Sept.

1 is the date set for completion of the work. Same firms were awarded the contracts for paving and installing curbing on Fifth St. from Broad to L at same prices.

**North Platte, Neb.**—\*G. V. Stack of Denver for laying 25 blocks of vertical fiber brick paving at \$2.17 1/8 per sq. yd., total approximately \$104,000.

**Elizabeth, N. J.**—\*Continental Public Works Co. for paving following streets with sheet asphalt on a 6-in. concrete foundation: Meadow St., from Magnolia Ave. to Jackson Ave., and Jackson Ave., from Meadow to Louisa Sts., \$31,987.40; Bayway, from West Grand to Chilton Sts., \$23,096.32; Grove St., from Rahway Ave. to Murray St., \$8,234.74; Dewey Pl., from Rahway to Fay Aves., \$4,812.70, and Clover St., from Murray St. to Linden Ave., \$4,595.65. \*Leonhard Stone Co. for grading, curbing and flagging following streets: Dewey Pl., from Rahway to Fay Aves., \$2,371.40, and South Park St., from Seventh to Trumbull Sts., \$3,169.40. For paving Grove St., from Linden to Jersey Ave., with brick on a 6-in. concrete foundation, \*Samuel Sampson, for \$716.60.

**Newark, N. J.**—For supplying liquid asphalt and preparing the road for its use, as follows: Standard Oil Co., oil 215 a gallon and five and a half cents for scarifying roads; Northern Const. Co., oil 235 a gallon and five and a half cents for scarifying roads; Air Cleaned Roads Co., oil 239 a gallon and six cents for scarifying. The two latter bids were according to specifications, which called for Finlay method of air cleaning stones after road was scarified and immediately prior to applying oil. The Standard Oil Co. based its bid on cleaning stone according to its own air cleaning method. Bid was referred to the county engineer to determine if it was acceptable. About eight miles of road will be treated with this process this year. Bids for non-asphaltic oil called for supplying four different sections of the county. No offers were received for the second section. Logan & Hathaway bid .0845 per gallon for sections one and three, J. H. Hopwood of Caldwell bid .07% a gallon on sections three and four. The price paid for the same grade oil last year was .059 a gallon.

**Passaic, N. J.**—\*Union Building & Construction Co., for repaving Monroe St.

**Red Bank, N. J.**—\*Monmouth Contracting Co., local, for graveling Seven Bridge Road from the Rumson Road to Seven Bridges, distance of about 4,000 feet, for \$2,545.80.

**Albany, N. Y.**—\*Michael F. Dollard to improve Lancaster St. between Main Ave. and West Lawrence St. for \$10,953.90; Wilbur St. between Grand and Philip Sts., for \$5,196.35, and the Albany-Delmar road for \$1,246.45. For improving Knox St. from Morris St. to Myrtle Ave., \*Cramond Construction corporation for \$3,327.80.

**Dunkirk, N. Y.**—\*Lake Shore Cons. Co., Dunkirk, to pave Central Ave., for sum of \$30,469. Section to be improved is 1 1/2 miles long.

**Dunkirk, N. Y.**—Lowest bids for paving received May 16th were as follows: McKinley Ave.: Brick, cement-sand cushion, \$4,338, by James McNamara; Monolithic brick, \$4,538, James McNamara; sheet asphalt, \$4,188.10, John McCormack & Son; concrete, \$3,978, James McNamara. East Second St.—Concrete Curb and Gutter: Brick on sand cushion, \$22,097.70, by James P. Morrissey; brick, cement-sand cushion, \$22,527.55, Lake Shore Con. & Sup. Co.; monolithic brick, \$22,527.55, Lake Shore Con. & Sup. Co.; sheet asphalt, \$19,802.20, John McCormack & Son; concrete, \$20,549, James P. Morrissey; one-course concrete, \$19,638, James P. Morrissey; bitulithic, \$25,685.25, Warren Brothers Co. East Second St.—Stone Curb: Brick on sand cushion, \$23,605.40, by James P. Morrissey; brick, cement-sand cushion, \$24,512.73, Lake Shore Con. & Sup. Co.; monolithic brick, \$24,512.73, Lake Shore Con. & Sup. Co.; sheet asphalt, \$21,667.97, John McCormack & Son; concrete, \$21,914.53, James P. Morrissey; one-course concrete, \$20,919.58, James P. Morrissey; bitulithic, \$27,469.33, Warren Brothers Co.

**Little Falls, N. Y.**—\*Patrick Kearney, for curbing Prospect and Furnace Sts., at \$15,000 and \$1,249.50, respectively.

**Lockport, N. Y.**—For road work, as follows: Fillmore Chapel, Ransomville Rd., in Porter and Lewiston, W. F. Fel-

ton, of Buffalo, \$47,561.94; Beebe Chestnut Rd., in Wilson, Bush & Percival, of Kenmore, \$48,201.14, and Pendleton-Wheatfield Town Line Rd., F. J. Munn Contracting Co., of Buffalo, \$17,149.

**Poughkeepsie, N. Y.**—For 24,800 sq. yds. brick pavement on 5-in. concrete base, earth excavation: \*Schenectady Const. Co., Schenectady, at \$2.16 per sq. yd. for paving, 21 cts. per sq. yd. excavation, total bid, \$64,229.

**Rochester, N. Y.**—For local improvements as follows: Merchants' Rd. and Garson Ave. sewer, \*James Passero, at \$20,969.30; Virginia Ave. asphalt pavement, \*Ribstein-Holter Co., at \$19,717.50; Syke St. brick pavement, \*Oliver Costrich Co., at \$9,434.50; laying cement walks in Electric Ave., \*Genesee Construction Co., at \$154.50; relaying walks in Raines Park, \*John J. Regan & Son, at \$237; laying cement walks in Magee Ave., \*Genesee Construction Co., at \$198.50.

**Cincinnati, O.**—For improvement of Lincoln Ave. from Stanton to Alms Pl.: \*Paul M. Kingsley, at \$17,676. Purchasing agent was directed to enter into contract with Barber Asphalt Co. for 35 tons of "Trinidad" asphalt at \$20.50 a ton and with Warner-Quinlan Co. for 65 tons of "Montezuma" asphalt at \$21.50 a ton.

**Cincinnati, O.**—\*Kenton Road Oil Co., for oiling country roads.

**Finlay, O.**—\*Wm. E. Dorsey of Finlay, for construction of two sections of Dixie highway between this city and Bluffton; \*Heystek-Baker Co. of Kalamazoo, Mich., for the third section. Total length of the road to be improved is about 13 miles, and cost will be \$218,791.94. The road is to be built with brick.

**Massillon, O.**—\*Dieffenbacher & Sons, local, for paving three miles of McDonaldsville Rd., at \$65,785.70.

**New Albany, O.**—\*Goulding Bros. for improvement of alley between East and Thomas Sts., at \$1.95 per foot.

**Piqua, O.**—\*J. M. Hennessey & Bro., local, for constructing about 100 feet of brick paving on the Troy-Piqua pike.

**Toledo, O.**—\*Butler Construction Co., for paving Willard St., from Starr Ave. to Kelsey Ave., for \$6,297.08, and Whittemore St., from Front St. to the Toledo Belt railway, \$14,036.35, both with sheet asphalt on concrete foundation. Austin St. from Cherry to Lagrange, \*H. P. Streicher Co., Inc., \$15,299.49, sheet asphalt. Ewing St., Dorr to Norwood Ave., \*Asphalt Block Paving Co., \$7,421.47; asphalt block on concrete foundation. 4th St., Platt to Kelsey Ave., \*Peters Bros. & Co., \$4,040.70; vitrified brick on concrete. Kelsey Ave., east Broadway to Belt St., \*Harris & Tansey, \$25,649.88; vitrified brick on concrete. McKinley Ave., Navarre Ave. to Earl St., \*Peters Bros. & Co., \$11,675.05; vitrified brick on concrete. Oakland St., from Cherry to Blanchard, \*Asphalt Block Paving Co., \$7,877.40; asphalt blocks on concrete. Ontario St., from Monroe St. to Jefferson Ave., repaving, \*H. P. Streicher Co., \$4,161.71; sheet asphalt on concrete.

**Urbana, O.**—\*Miller & Saxbe for sprinkling and flushing streets at bid of \$665 per month.

**Youngstown, O.**—For constructing roads, as follows: Liberty Rd., Coltsville Twp., \*Quigley & Meeker, \$4,487.85; Elm St. extension, Struthers, \*J. P. Morrison & Co., \$6,487.85; Boardman-Canfield Town Line Rd., Secs. 1 and 2, \*S. H. DeGrodt, \$18,034.50.

**Bridgeburg, Ont.**—\*W. G. Somerville & Co., Welland, for 1,000 yds. of granolithic walk at 8 cents per sq. ft.

**Corsicana, Tex.**—For paving as follows: West 6th Ave. between 11th and 15th Sts.; 16th St. between 2d and 7th Aves., and West 13th Ave. between 15th and 18th St. paving to be asphaltic concrete: \*Cleveland-Trinidad Paving Co., Cleveland, O. West 5th Ave. between 15th St. and 18th St., and between 20th and 24th Sts., was awarded to this company also. \*Southern Pavin' Co., by Lester Levy, for 20th St. from 5th to 6th Ave.; 23rd and a Half St. between 5th and 7th Aves.; 24th St. between 2nd and 5th Aves.; 29th St. between 2d and 4th Aves.; Summit Ave. between 18th and 29th Sts.; 12th and 13th Sts. between 3rd and 2nd Aves., paving to be asphaltic concrete. \*Vibrolithic Co., of Dallas, for West 5th Ave. between N. 11th and 15th St., and W. 6th Ave. between N. 15th St. and 18th St. For alleys east and west of Beaton St., \*Standard Paving Co. and same company was given contract



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THE PATERSON MANUFACTURING COMPANY, Limited:				Montreal	Toronto	Winnipeg	Vancouver
St. John, N. B.				Halifax, N. S.	Sydney, N. S.		



for vertical fiber brick on East 4th Ave., between Beaton and 10th Sts.

**Leary, Tex.**—Will T. Jordan, of Texarkana for graveling about 10 miles of turnpike from Leary to New Boston.

**Chehalis, Wash.**—George J. Albers & Son, Chehalis, for constructing one mile of concrete pavement for Thurston Co., at about \$15,000.

**Olympia, Wash.**—For 4,200 cu. yds. gravel surfacing on Inland Empire Highway, Colville South, as follows: \*H. C. Root, Spokane, at 67½¢, total \$2,835; Mike Martin, Spokane, \$1.05, total \$4,410; F. A. McCaslin, Colville, \$1.12, total \$4,704; Stevens County Construction Co., Kettle Falls, \$1.75, total \$7,350; E. D. Miner, Colville, 98¢, total \$4,116.

**Spokane, Wash.**—J. W. Hastings, W. 2118 Dean Ave., Spokane, only bidder for grading, curbing and constructing sidewalks on Myrtle St., at \$5,910.

**Spokane, Wash.**—Standard Asphalt Paving Co., for paving Grand boulevard with Spokane bituminous No. 2, at bid of \$31,046.

**Tacoma, Wash.**—For paving ¼ mile of Helms-Bowman Rd.: \*Warren Construction Co., on bid of \$10,217. Paving will be bitulithic on a 5-in. crushed rock base.

**Janesville, Wis.**—B. P. Crossman, for constructing sidewalks for city.

**Superior, Wis.**—For road work as follows: Section 1 of Military Rd., \*Schmidt Bros. & Co., \$7,914; Section 2, \*F. A. Baxter, \$4,699; Spaulding Ave., \*C. O. Lindquist, \$4,384.

### SEWERAGE

**Tucson, Ariz.**—Resolution calling for bids on big system of northside sewers, has been passed. Work will cost approximately \$200,000.

**Los Angeles, Cal.**—Ordinances authorizing construction of sewers in McCollum St. and New Hampshire Ave. have been approved by council. Chas. L. Wilde is City Clerk.

**Los Angeles, Cal.**—City will have election June 6 in regard to bond issue for sewage disposal at Hyperion and at Los Angeles Harbor. Homer Hamlin is City Engineer. W. T. Knowlton, Engr. of Sewers.

**Stockton, Cal.**—Stockton will spend approximately \$100,000 on new sewage disposal system in near future under bond issue voted last year. Two disposal plants are to be erected and these will have Castner system as their model.

**Woodland, Cal.**—See "Water Supply."

**Haverhill, Mass.**—Order has been passed for an eight-inch sewer pipe in Wellington Ave., 75 feet.

**Pittsfield, Mass.**—See "Water Supply."

**Pittsfield, Mass.**—Finance committee considering proposition to construct drain in Parkside Ave. at cost of \$19,500. It is planned to have drains not only on Parkside Ave. but also for several streets off Parkside Ave., including Melrose Ave., Rutledge Ave., Ventura Ave., and other small streets.

**Waltham, Mass.**—Appropriation of \$4,000 has been made for sewer construction.

**Bay City, Mich.**—Council has awarded contracts for sewers in several streets and has ordered construction of sidewalks in several streets. Lovell M. Grant is Recorder.

**Duluth, Minn.**—See "Streets and Roads."

**Duluth, Minn.**—Sanitary sewer will be ordered in Piedmont Ave., from Forest St. to Bay View terrace.

**McComb City, Miss.**—Board of mayor and selectmen has decided to issue bonds to amount of \$90,000 for purpose of installing an up-to-date system of sewerage. Bonds will be sold June 20, at which time contract for work will be awarded.

**Bozeman, Mont.**—See "Water Supply."

**Binghamton, N. Y.**—Ordinances have been adopted authorizing construction of sewers in three streets.

**Niagara Falls, N. Y.**—See "Water Supply."

**Niagara Falls, N. Y.**—International Joint Waterways commission will give a hearing in Buffalo on June 21 on its plans to prevent pollution of boundary streams by construction of sewage plants by cities along frontier. Tentative plans have been given officials of all municipalities interested on both sides of the Niagara river. Estimated cost of a sewage disposal system for Buffalo is \$3,600,000. The commission estimates annual operating expense at \$203,500. The plan favored is treatment of sewage in Imhoff

tanks. Estimated cost of the two disposal plants Niagara Falls would require is \$788,850. Operating expenses are estimated at \$28,500 a year. Disposal plant for Niagara Falls, Ont., would cost \$83,000. The La Salle plant would cost \$40,000.

**Pittsburgh, N. Y.**—Proposals will be received until June 26 for purchase of \$200,000 sanitary sewer bonds. Harry W. Slick is city treasurer.

**Schenectady, N. Y.**—Sewer bond issue of \$60,000 has been sold to Sidney Spitzer & Co., 115 Broadway, New York City, at \$60,077 and accrued interest.

**Yonkers, N. Y.**—Plans and specifications prepared by City Engineer Fulton for sewer in Fairview St. have been approved by Council.

**Shelby, N. C.**—See "Streets & Roads."

**Marion, O.**—Council has approved ordinance for construction of storm water and sanitary sewer on Wood St. H. A. Stevens is Clerk.

**Middletown, O.**—Engineer has been instructed to prepare plans and specifications for laying sewer in Cooch and Calumet Sts.

**Springfield, O.**—Council has passed ordinances for construction of storm sewers in several streets.

**Oklahoma City, Okla.**—See "Water Supply."

**Portland, Ore.**—Council has ordered plans to be prepared for reconstruction of Tanner Creek sewer at estimated cost of about \$225,000.

**Erie, Pa.**—City Engineer Briggs has been instructed to prepare data for storm water sewers in the west side.

**Erie, Pa.**—Legislation in connection with issuance of \$70,000 worth of storm water sewer bonds will be introduced in council this morning by William D. Kinney, director of streets and public improvements.

**Johnstown, Pa.**—C. B. Collins and Co. was awarded contract to prepare plans for proposed sanitary sewer system for borough.

**Woonsocket, R. I.**—Resolutions appropriating \$3,050 and \$4,950 for sewer construction have been referred to finance committee.

**Westerly, R. I.**—Citizens have promised to support plans for proposed sewerage system.

**Elkhart Lake, Wis.**—Village voted to issue bonds in amount of \$15,000 for sewerage improvements.

**Racine, Wis.**—There are two large contracts still to be awarded in connection with Root River drainage project. There will be about 15 miles of laterals and 13 concrete bulkheads located at points where tiled laterals connect with open ditch. In addition there will be a number of concrete bridges to be constructed at points where ditch crosses highways. These bridges will cost about \$10,000. The laterals will cost the district about \$40,000, the contract being one of the largest provided for in this section of the state for many years. The largest tile to be used is 20 ins. in diameter. Of this size there will be 1,380 ft. Amount and size of other tile which enters into the lateral construction follows: Eighteen-in., 1,520 ft.; 16-in., 3,000 ft.; 15-in., 5,100 ft.; 14-in., 16,420 ft.; 12-in., 22,897 ft.; 10-in., 18,260 ft.; 8-in., 7,357. Contract for laterals, bulkheads and bridges will be awarded by commissioners within 30 days. Commissioners are James L. English, Geo. Beaumont and Henry Pfeiffer. Engineer who drew the specifications and laid out the route is P. J. Hurtgen, of Burlington.

### BIDS RECEIVED AND CONTRACTS AWARDED.

(\*Indicates contract awarded.)

**Mesa, Ariz.**—\*C. Fisher & Co. for making sewer connections.

**Jacksonville, Fla.**—\*Dysard Const. Co., Atlanta, lowest bidder, for sewer construction at \$17,751.05.

**Pontiac, Ill.**—\*E. Sherman Baer Co., of Streator, for construction of sewage disposal plant for city, at \$18,538.

**Lexington, Ky.**—For constructing Forest Hill branch of North Main sewer, as follows: Congleton Construction Co., \$4,326.70; C. B. McGregor, \$4,349; and Carey-Reed Co., \$5,257.50. City Engineer's estimate for the sewer, which is 2,730 ft. in length, was \$4,400.

**Duluth, Minn.**—For laying sewer in Minnesota Ave., from 9th to 12th St., \*Gilman-Murphy-Patterson Co., at \$1,463; laying sewer in Carlton St., from Lincoln Ave. to 37th Ave. W., and in 37th

Ave. W. to 6th St., \*Riback & Parvi, at \$861.11.

**Duluth, Minn.**—See "Streets & Roads."

**Webb City, Mo.**—For construction at an aggregate cost of about \$3,000 of three new district sewers, for districts 9, 41 and 47, \*H. Kost for Nos. 9 and 41, \*V. E. Koch for No. 47.

**Newark, N. J.**—Arthur McMullen Company low bidder for Passaic Valley sewer, part of section 4, bulkhead, flushing intake, sludge main & appurtenances, at \$74,800. Contract will be let by Passaic Valley Sewerage Comrs.

**Binghamton, N. Y.**—For vitrified and reinforced concrete pipe sewer, as follows: Sewer Disposal & Water Plant Co., Schenectady, N. Y., \$166,071; James F. Leary Cons. Co., Rochester, N. Y., \$213,386; Frank Carlucci, Scranton, Pa., \$234,441; D. M. Rosser, Wilkes-Barre, Pa., \$248,930; Parsons Cons. Co., Binghamton, \$261,557.

**New York, N. Y.**—(Borough of Manhattan)—For storm relief sewer in 114th St. from 1st Ave. to East River: \*John C. Rogers, Jr., 271 West 125th St., at \$46,719.

**Durham, N. C.**—\*Obenshain Const. Corp., for 6½ miles 24-in. line terra cotta sewer, at \$24,961.60; \*S. N. Slade, for 4 miles 10-in. line sewer, at \$7,699.35. H. Kueffner is city engineer.

**Mt. Union, Penn.**—For sanitary and storm sewers: \*Fogel & Co., Hollidaysburg, at \$5,900.

**Winnier, S. D.**—For sewer system \*Charles H. Green Co., Spokane, Wash.

**Norfolk, Va.**—\*Louis Lawson to furnish and lay sewer pipes on Leigh, Ambler, Graydon, Brandon, Weyanoke and Mallory avenues.

**Huntington, W. Va.**—For sewer in Holligurst addition: \*Amos Trainor, at \$4,895. A. B. Maupin, is City Engr.

**Racine, Wis.**—\*Cole Bros., Neenah, Ind., for Root River drainage ditch, nearly 18 miles long, to reclaim approximately 7,000 acres of wet and swampy land in Racine and Kenosha counties. Total cost estimated at \$35,000.

### WATER SUPPLY.

**Woodland, Cal.**—City of Woodland voted bond issue of \$55,000 for extension of the municipal water system and a \$6,000 bond issue for the extension of city sewer system.

**Waukegan, Ill.**—Council discussing proposition to purchase new boiler for water works.

**Muscatine, Ia.**—Plans have been completed for enlarging water mains on Hershey and Iowa Aves. and on 4th St. Fire hydrants will be installed in every alley between 2d and 3d Sts. as far west as Pine St. and as far east as Oak St.

**Agawam, Mass.**—Town has voted to extend water-main in North St. as far as may be necessary. It was voted to petition Legislature of 1917 for authority to issue bonds for \$25,000 in addition to former acts for purpose of extending town's water system.

**Lawrence, Mass.**—City council voted to advertise an order creating a loan of \$60,000 for improvements in filter plant of water department.

**Pittsfield, Mass.**—Council has adopted order for \$15,000 for water main extensions and also an order for \$10,000 for lateral sewers.

**Pittsfield, Mass.**—Council has voted as follows: To lay main sewer in Dickinson Ave. from Roland St. northerly about 200 ft. To purchase one car of rotar and one car of tarvia B for street sprinkling purposes. To install hydrant on the Dalton road at the storehouse of Crane & Co. near Hubbard Ave. To ask for bids for putting on flashboards on Farnham dam, to be returned June 2, at 7.30 p. m. By putting on of these boards storage capacity of reservoir will be greatly increased. To extend main sewer in William St. from Arlington St. to Waverly St., and in Waverly St. about 100 feet.

**Bozeman, Mont.**—Sweet, Causey & Foster of Denver, through their agent, L. E. Torrence, bought two issues of Boneman city bonds, aggregating \$305,000. Bonds were in two issues, authorized at a recent election, one for \$235,000 for water improvement and extension, and the other for \$70,000 for sewer extension. Successful bid on the issue of \$235,000 20-year bonds bearing 5 per cent., was premium of \$9,595 above par. High bid on issue of \$70,000, bearing same interest rate, was a premium of \$2,835 above par.

**Alamogordo, N. M.**—Contract awarded to John M. Wyatt, El Paso, Texas, for

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NEW ORLEANS  
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**MINNEAPOLIS  
DENVER  
ALBANY**



\$275,000 water system bonds and \$25,000 electric light and power plant bonds, at par and interest on a 5½ per cent. basis.

**Lovelock, Nev.**—The \$90,000 Lovelock water bond issue has been sold to First National Bank of Winnemucca. Bonds brought a small premium. Municipal system will be built.

**Irvington, N. J.**—Proposals have been invited by town commission for centrifugal pumping equipment of electric type, to be installed on municipal playground for filling wading pool.

**New Brunswick, N. J.**—Three resolutions were presented at recent meeting of the city commission by Mr. Morrison authorizing issuance of \$79,000 worth of bonds for water improvement, \$40,000 worth of city hall bonds, and \$14,000 worth of fire bonds, all to be denomination of \$1,000 each and to bear interest not to exceed 4½ per cent. annually. Resolutions were laid over for two weeks and if finally adopted will empower Mr. Morrison to receive sealed bids on three issues of bonds, estimates being asked with interest fixed at 4 per cent., 4¼ per cent. and 4½ per cent. in each instance. Water improvement bonds are designed to take care of filtration plant to be erected in the west basin of reservoir in this city; the city hall bonds are to cover purchase price of the Cogswell Place, on Bayard St. and remodeling and furnishing same, while fire bonds are to pay for a combination chemical and hose wagon and the purchase of two chassis for hose wagons and mounting same.

**Perth Amboy, N. J.**—Ordinance providing for issue of water bonds for city to the amount of \$100,000, to be used to extend water main from Ernston standpipe to the Raritan river, has been passed.

**Carthage, N. Y.**—Question of connection of water systems of Carthage and West Carthage is being discussed.

**Millville, N. Y.**—State Board of Health has approved plans for proposed pumping station to be constructed at corner of Sassafras and Buck Sts. Station will force sewage from Main St. Hill up into sewer which slopes to disposal plant in South Millville. Bids will be called for shortly. Newton B. Wade is city engineer.

**Niagara Falls, N. Y.**—Petitions by property owners for sewer, water and gas connections in Main St. have been referred to city manager.

**Peekskill, N. Y.**—Following resolution has been passed: That Board of Water Commissioners be requested to furnish proper spring faucets in place of former water troughs in order that water may be drawn for watering horses and also that Board does not favor any attachment for such purpose to fire hydrants.

**Skaneateles, N. Y.**—Water refunding bonds in sum of \$25,000 have been sold to Skaneateles Savings Bank, at \$25,025.

**Yonkers, N. Y.**—Recommendation from Public Works Commissioner Brady, recommending that water bureau be authorized to expend sum of \$650 for purchase of a manual control chlorinator to be installed at the filtration plant referred to committee on police, fire and water.

**Yonkers, N. Y.**—Council has approved the following recommendations: Recommendation that there be issued \$42,000 fire bureau bonds to mature in fourteen annual installments; \$160,000 water bonds to mature in forty annual installments, and \$57,000 hospital bonds to mature in nineteen annual installments, all bonds to draw interest of not more than 4¼ per cent.

**Shelby, N. C.**—See "Streets & Roads."

**Bowling Green, O.**—Commissioners of Wood, Seneca and Sandusky counties will meet June 2 at Bowling Green for purpose of considering petitions of property owners of three counties asking for improvement of Mud creek.

**Oklahoma City, Okla.**—Bonds calling for \$1,500,000 for improvements in water works, for city extension of sewers and for building of a provident home, carried in an election here recently. In extension of water works system it is planned to build huge reservoir north of city covering more than 50 acres.

**Erie, Pa.**—George C. Gensheimer, secretary, has been directed to advertise for bids for 7,600 ft. of 20-in. pipe in 19th St. from French St. to East Ave., at cost of approximately \$4 a ft.

**Norfolk, Va.**—Repairs of the 24 and 30-in. water mains on Princess Anne Ave. and Norfolk & Western crossing are contemplated.

**Tacoma, Wash.**—Pipe line from South Tacoma wells to Hood street reservoir for distance of 3½ miles has been authorized by city council on recommendation of Water Superintendent P. S. Savidge.

#### BIDS RECEIVED AND CONTRACTS AWARDED.

(\*Indicates contract awarded.)

**Huntington, Ind.**—\*Julius H. Werling, at 85c. per ft., for deepening 13 wells at water works station.

**Pleasantville, Ia.**—For water works system: \*C. Roland & Co., Des Moines, at \$16,750. J. K. Keefer is clerk.

**Albany, N. Y.**—\*R. B. Wing & Son for furnishing supplies for city bureau of water.

**New York, N. Y.** (Borough of Brooklyn).—Low bidder for hauling and laying water mains and appurtenances in several streets is Louis D. Gregory, 212 W. 138th St., New York.

**Rochester, N. Y.**—For 10-mile 37-in. water mains: \*T. A. Gillespie Co., 50 Church St., New York, N. Y. F. D. Elwood is city engineer.

**Rochester, N. Y.**—\*Rochester Lead Works, for supplying 5 tons of lead for season for Water Works Bureau, at 9½c per lb.

**Lexington, N. C.**—For 52,000 gal. reservoir and force pump: \*Harbin Construction Co., at \$8,100.

**Middletown, O.**—\*Hoover, Owens, Rent-schler Co., for supplying 4,000,000-gal. engine, at \$16,470; \*U. S. Cast Iron Pipe & Foundry Co., Philadelphia, Pa., for supplying cast iron pipe, at \$15,405; \*Jas. B. Clow & Sons, Chicago, Ill., for valves, at \$1,782; \*Dravo-Doyle Co., for Venturi meter, at \$895, and two low service electrically driven pumps at \$4,385.

**Commerce, Okla.**—\*N. S. Sherman Machine & Iron Works, Oklahoma City, Okla., for construction of distributing system of cast iron water mains, pumping station and reinforced concrete reservoir, at \$17,850. \*Worthing Pump & Machinery Corporation, Kansas City, Mo., for furnishing and erecting complete air lift equipment, duplex power pumps, motors, piping, and all electric equipment, at \$6,235. \*Chicago Bridge & Iron Co. for furnishing and erecting 75,000-gal. elevated tank and tower at \$5,700.

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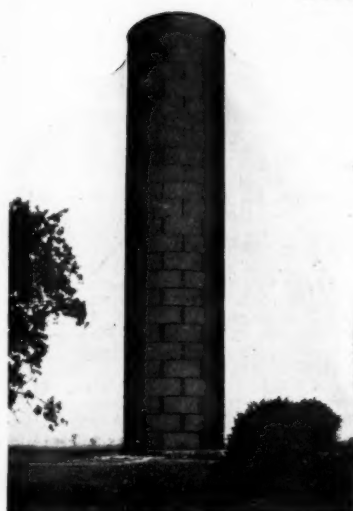
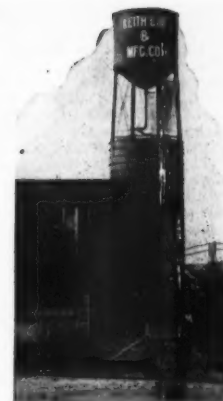
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**North Bay, Ont.**—A. Chinco for laying 2,725 ft. 6-in. pipe and 6,144 ft. 4-in. pipe for water main.

**Harrisburg, Pa.**—For castings to be used during the year as follows: E. N. Cooper & Co. bid \$2.20 a hundredweight and Harrisburg Foundry and Machine Works bid \$2.75.

**Mercer, Pa.**—For filtration plant: Pitt Construction Co., of Pittsburgh.

**Milford, Tex.**—For water system: \*E. D. Lunsdun, Sherman, at \$5,919.

**Norfolk, Va.**—W. M. Whaley & Co., to furnish water department with pipe dies for threading machine. \*W. P. Oberndorfer & Son, to furnish water department with 150 lengths 6-in. water pipes. \*R. O. Wood & Co., W. P. Oberndorfer & Son, local agents, to furnish water department with six 6-in. hydrants.

### MISCELLANEOUS.

**Mobile, Ala.**—New Orleans, Mobile and Chicago Railroad will extend its line from Middleton, Tenn., to Jackson, Tenn., a distance of forty miles, in the immediate future. Extension will cost \$1,225,000 of which \$500,000 is immediately available.

**Los Angeles, Cal.**—Agreement has been reached by Public Works Committee of Council that a 12-ft. easement shall be obtained to widen proposed route of Second St. tunnel, through Bunker Hill, instead of a 10-ft. easement. This will make it possible to have two 30-ft. bores, instead of two 29-ft. bores, and will make the tunnel large enough for street railway use.

**Placerville, Cal.**—See "Streets and Roads."

**San Francisco, Cal.**—Board of supervisors has passed ordinance to extend Municipal railway on Market St. so as to provide direct line from the ferry to Twin Peaks tunnel.

**Fruita, Colo.**—The \$55,000 worth of bonds issued by city have been purchased by state treasurer for State Agricultural College. The bonds will give net return of 5.35 per cent interest.

**Pensacola, Fla.**—Walton county contemplates election in July to vote on \$7,500 bond issue for proposed county court house.

**Streator, Ill.**—Council has voted to purchase two dump wagons for street department at estimated cost of \$105 each.

**Waukegan, Ill.**—City will purchase garbage incinerator.

**Indianapolis, Ind.**—J. F. Wild & Co. submitted highest bid for park bond issue of \$6,488, the company offering bid of par and a premium of \$175 with accrued interest.

**Lawrence, Kans.**—City commissioners awarded to Fidelity Trust Co. of Kansas City a \$70,000 bond issue which will be used to take up a former issue of city bonds. Fidelity company made a bid to pay all expenses of issue and premium of \$280.

**Beverly, Mass.**—Municipal bathhouse commission has accepted new plans for bathhouse at Oceanside park. There are several changes from original plans.

**Holyoke, Mass.**—Bond orders have been passed as follows: Permanent highways, \$120,000; buildings, \$68,000; to be expended as follows: Construction isolation hospital, \$20,000; addition to tuberculosis hospital, \$5,000; addition to Elm St. school building, \$1,500; addition to new high school building, \$1,500; fire alarm system, \$30,000; departmental equipment, \$29,000, to be expended as follows: Playgrounds, \$7,500; fire department automobile apparatus, \$17,000; street flushing machine, \$4,500; sidewalks, \$15,000; sewers, \$10,000.

**Marblehead, Mass.**—Selectmen are making an investigation of probable cost of new automobile suitable for conversion into motor ambulance, for which an appropriation of \$1,500 was made at last annual town meeting.

**North Adams, Mass.**—Committee of Merchants' association having in charge erection of ornamental arch at entrance to Mohawk Trail, has engaged Architect Newton C. Bond to draw plans for the arch and to superintend its construction. Mr. Bond is expected to have plans completed within a week, and contract for construction of it will be let as soon as possible.

**Eveleth, Minn.**—City will grant franchise to Mesaba Electric Railway Co. for installation of street car line on portion of Fayal Rd.

**Hibbing, Minn.**—Road foremen have been instructed to purchase new dump wagons if necessary.

**McComb City, Miss.**—Postmaster W. M. Robertson has been notified by postal authorities in Washington that plans for \$50,000 postoffice building for McComb City have been decided upon, and that work on structure will begin soon.

**Joplin, Mo.**—Ordinance has been passed authorizing Dr. R. B. Tyler, commissioner of health and sanitation, to enter into a contract on behalf of city for the collection of garbage. Contract has been drawn and will be signed shortly by Dr. Tyler and A. A. Wright of Anderson, Mo. Contract provides that garbage shall be kept in metallic vessels with airtight covers so no odors will escape therefrom, and that garbage shall be hauled in metal boxes, sides and ends of which shall be at least 24 inches high, so that none of the garbage will be thrown out.

**Missoula, Mont.**—Board of county commissioners awarded to Lumbermen's Trust Co. of Portland recent purchase of \$40,000 issue of 4½ per cent refunding bonds, which Missoula county is to float. Portland concern offered premium of \$325.25 above par on the bonds.

**New Brunswick, N. J.**—See "Water Supply."

**Orange, N. J.**—A proposition to erect an incinerating plant or make a contract for disposal of garbage with some firm which makes specialty of garbage disposition with idea of utilization, will be referred to city commission for its consideration.

**Passaic, N. J.**—Passaic's issue of bonds, totaling \$286,000, sold to Blake Brothers & Co., New York, at their bid of \$104.41. There were three issues, one of \$144,000 funding and refunding bonds to take up maturing notes and outstanding obligations; \$45,000 funding and refunding school bonds, and \$97,000 park bonds. Bids for \$144,000 issue ranged from 102.91 to 104.41 of the successful bidder, and for the \$45,000 issue from 101.383 to 104.41. Bids for \$97,000 issue ranged from 102.91 to bid of Blake Brothers & Co., 104.41. Among bidders were Peoples Bank and Trust Co., of this city, who offered 103.799 on three issues. J. S. Ripple of Newark bid 103.918 on the \$144,000 issue; 103.668 on the \$45,000 issue and 103.419 on the \$97,000 issue. Outwater and Wells of Jersey City bid 102.91 on the \$144,000 issue and same on the other two issues. Premium on the bonds is \$12,612.60.



**Albany, N. Y.**—Common Council on June 5 will be asked to appropriate \$20,000 to carry on work of improvement of Beaver Park.

**Niagara Falls, N. Y.**—Construction of public bathing beach in Porter Park at cost of \$4,500 is contemplated.

**Niagara Falls, N. Y.**—Park advisory commission hopes to add two new parks to city system next year. In the 1917 budget, approved at recent meeting, there is \$9,500 for purchase of a triangular strip of land about one-half acre at Main St. and McKoon Ave., and \$12,500 to convert part of De Veaux college woods into city park. Budget calls for \$30,500.

**Yonkers, N. Y.**—See "Water Supply."

**Fargo, N. D.**—Town contemplates construction of incinerating plant. Committee has been appointed to visit other towns for purpose of selecting a suitable model.

**Cleveland, O.**—Mayor has approved ordinance authorizing \$500,000 bond issue for construction of Public Hall for Auditorium and Exposition purposes.

**Columbus, O.**—Sealed proposals will be received by N. J. Ford, clerk of board of education, at Kingston, Ross County, until June 7, for purchase of bonds of Kingston Village school district of Ross county, in aggregate amount of \$30,000, dated July 1.

**Hamilton, O.**—Council has adopted resolution to submit question of bond issue for new city hall to voters at November election and meeting May 31 to consider definite proposals.

**Eugene, Ore.**—Question of remodeling city hall is being discussed.

**Gardiner, Ore.**—The \$200,000 bond issue recently voted by people of the Port Umpqua district for purpose of building jetty at mouth of the Umpqua river, has been sold at auction to highest bidder, Mr. Glenn, representing Keeter Bros., of Denver, Colo., for \$193,527.

**Oakmont, Pa.**—Commissioners of Havertown township, who recently established police department, have purchased an acre of ground near Oakmont Station, on which 2-story, stone police station will be erected. Building will also include offices for township commissioners, township treasurer and Board of Health.

**Cranston, R. I.**—Council has approved bond issue of \$40,000 for erection of addition to high school and city treasurer has

been authorized to sell bonds to raise fund.

**Greenville, S. C.**—Council will be petitioned for installation of six sanitary drinking fountains in business district and for overhauling and replacing of street signs.

**Port Arthur, Tex.**—City commission has received plans and specifications for municipal abattoir, which was authorized in a bond election some time ago, and which cost \$20,000. Commissioners will proceed without any further delay to work of erecting abattoir.

**Salt Lake City, Utah.**—See "Streets and Roads."

**Norfolk, Va.**—Public Improvement Committee will recommend appropriation of \$20,000 for improving Smith's Creek.

#### BIDS RECEIVED AND CONTRACTS AWARDED.

(\*Indicates contract awarded.)

**Waterbury, Conn.**—For building diversion dam and tunnel in connection with Wigwam brook: \*William T. Ryan, of Hartford, at \$33,275.

**Jacksonville, Fla.**—\*Eppinger & Russell, for driving piling for municipal docks to be constructed.

**Laporte, Ind.**—Studebaker Corp., South Bend, Ind., for eight-foot, combination sprinkler and sweeper at \$319.41.

**Roselle, N. J.**—\*F. A. Thompson, Unionville, N. J., for furnishing team and man for garbage collection for 300 days for sum of \$1,950.

**Brooklyn, N. Y.**—Dennis E. Connors was low bidder at \$1,376,000 for Livonia Av. extension of Eastern Parkway subway.

**Brooklyn, N. Y.**—\*Mason & Hanger Co. for subway construction, at \$2,000,000.

**New York, N. Y.**—For station finish on Sects. 7 to 11, inclusive, of Route 5, Lexington Ave. subway, there were nine bidders, lowest being \$266,000, by John B. Roberts, 3 W. 29th St., and highest, \$369,276.97, by Bradley & Ward, 200 5th Ave.

**New York, N. Y.**—For construction of Section 1, Route 8, of Fourteenth St. Eastern District rapid transit Rd. were as follows: Booth & Flynn, Limited, \$2,527,295; Patrick McGovern & Co., \$2,698,545; MacArthur Brothers Co., \$2,746,028; Oscar Daniels Co., \$2,770,000; Smith,

Hauser & MacIsaac, Inc., \$2,777,000; Degnon Contracting Co., \$3,063,000; Rodgers & Hagerty, Inc., \$3,130,000; J. F. Cogan Co., \$3,183,000; Underpinning and Foundation Co., \$3,434,000. \*Mason & Hanger Co., Inc., the lowest bidders, at \$1,847,174.40, for that portion of the line under North Seventh St. and Metropolitan Ave. from Bedford Ave. to Manhattan Ave., Williamsburg. This is Section 4 of Route 8. The contract now goes to Board of Estimate for approval. The highest bid was \$2,727,246.50 from the Underpinning and Foundation Co.

**New York, N. Y.**—For construction of the section of 14th Street-Eastern Dist. rapid transit line, extending as a subway under Metropolitan and Bushwick Aves. from a point near Manhattan Ave. to Meserole St., Brooklyn, officially designated as Section 5 of Route 8. Bids were received as follows: MacArthur Brothers Co., \$1,336,000; J. F. Cogan Company, \$1,342,000; Rodgers & Hagerty Company, \$1,386,000; Degnon Contracting Company, \$1,434,000; E. E. Smith Contracting Company, \$1,493,000; Oscar Daniels Company, \$1,521,000; John C. Sullivan, \$1,571,000; Underpinning and Foundation Company, \$1,700,000, and T. A. Gillespie Company, \$1,786,000.

**Syracuse, N. Y.**—\*Mondo Const. Co., for constructing 28,400 sq. ft. of Portland cement flooring for swimming pool at Onondaga Park at bid of 11 cts. per ft. Excavating of 1,300 cu. yds. of earth is necessary, and the same firm got this contract at 34 cts. per yd.

**Providence, R. I.**—For erection of new recreation house at Livingstone St. playground as follows: Famiglietti Bros., \$3,900; William H. Hamlin & Sons, \$3,283; C. I. Bigney Construction Co., \$4,169; Alexander Martin, \$4,250; Thomas F. Tobin, \$4,463. For plumbing in the building: Samuel Jackson Co., \$759; Tierney-Colgan Co., \$657. For grading playground: Famiglietti Bros., \$2,200; W. Harrison Jordan, \$1,924; Alexander Martin, \$2,428; Antonio Aiello, \$2,220. For furnishing public works department with filter cloth up to 6,000 yards, Calender, McAuslan & Troup Co., at 23 cts. per yd.

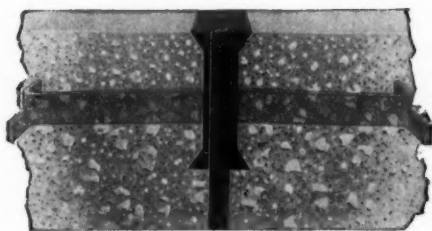
**Wichita Falls, Tex.**—\*Lisle Dunning Const. Co., Oklahoma City, for construction of county courthouse at \$200,000.

### TOO LATE FOR CLASSIFICATION

#### BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
<b>STREETS AND ROADS.</b>				
Wis.	Oshkosh.....10 a.m., June	3..	Curbing and paving with first-class pavement.....	Wm. Porath, Bd. Pub. Works.
Mont.	Anaconda.....8 p.m., June	5..	Paving with asphaltic concrete or bitulithic.....	M. J. Kelly, City Clerk.
Minn.	Carlton.....10 a.m., June	5..	Graveling state roads.....	A. R. Norman, Co. Aud.
S. D.	Huron.....1 p.m., June	5..	Laying 9,000 sq. yds. first-class pavement.....	J. B. Sullivan, City Engineer.
Mass.	Boston.....noon, June	5..	Furnishing 200,000 gals. of road oil.....	D. F. Doherty, Supt. of Sup.
Mass.	Boston.....noon, June	5..	Laying asph., Topeka or bitulithic pav't on 5 streets....	E. F. Murphy, Commissioner of Public Works.
N. Y.	Albany.....3 p.m., June	5..	Curbing, grading and paving with brick.....	Board of Contract & Supply.
Minn.	Brainerd.....2 p.m., June	6..	Furnishing 50 carloads of crushed stone.....	C. W. Mahlum, Co. Aud.
Wis.	Jefferson.....7:30 p.m., June	6..	Laying cement walks and cross walks.....	J. B. Brewer, Bd. Pub. Works.
Pa.	Johnstown.....noon, June	6..	Paving with sheet asphalt, brick and concrete.....	G. M. Harshberger, Supt. of Highways.
Va.	Portsmouth.....noon, June	6..	8,000 sq. yds. of concrete sidewalk.....	Commission'n of Rds. & Bridges, Commercial Building.
Wis.	Madison.....5 p.m., June	7..	Laying 6,000 sq. yds. wood block pavement.....	E. E. Parker, City Engineer.
Ill.	Springfield.....June	7..	Improving road near Galesburg.....	State Highway Engineer.
Ia.	Knoxville.....2 p.m., June	6..	15,500 sq. yds. brick, concrete, bitulithic or asph. concr..	P. M. Black, City Clerk.
Mont.	Dillon.....8 p.m., June	9..	Cement walks, crossings and curbs.....	H. G. Rodgers, City Clerk.
Tenn.	Madisonville.....1 p.m., June	9..	75 miles of grading and 90 miles of macadam and chert..	L. A. Hunt, Sec'y. Co. Pike Com.
O.	Columbus.....noon, June	23..	200,000 old style paving blocks, 300,000 new style, 500 tons pitch, 2,000 yds. sand, 8,000 tons macadam stone, 5,000 tons of dust or screenings, 1,000 yds. crushed slag and 20,000 gals. bituminous material.....	G. A. Borden, Pres. Board of Purchase.
N. J.	Elizabeth.....3 p.m., Ju.	13..	30,000 sq. yds. bituminous concrete.....	J. L. Bauer, Twp. Engineer.
N. J.	Paterson.....2 p.m., June	14..	Paving with asphalt and bituminous concrete.....	County Engineer.
Wis.	Oshkosh.....10 a.m., June	17..	Macadamizing and constructing concrete curb and gut..	Wm. F. Porath, Bd. Pub. Wks.
Pa.	Sharpsville.....noon, June	20..	6,865 yds. paving (material not decided).....	W. A. Graber, Boro. Sec'y.
<b>SEWERAGE.</b>				
N. D.	Grand Forks...4 p.m., June	5..	500 ft. 12-in. sewer.....	W. H. Alexander, City Aud.
S. D.	Aberdeen.....8 p.m., June	5..	Constructing lateral sewers.....	City Engineer.
S. D.	Mitchell.....8 p.m., June	5..	Constructing lateral and trunk sewers.....	City Clerk.
N. Y.	Albany.....3 p.m., June	5..	Constructing vitrified sewer.....	Bd. of Contract & Supply.
Neb.	Albion.....4 p.m., June	8..	Constructing sewers.....	M. B. Krause, City Clerk.
N. J.	Carlstadt.....8 p.m., June	8..	8,550 ft. sewers.....	Ernest Walmach, Boro. Clerk.
Ia.	Dyersville.....6 p.m., June	12..	1,600 ft. 6 and 8-in. sewers and 4 manholes.....	W. C. Loosbrock, Town Clerk.
Minn.	Morris.....2 p.m., June	16..	Constructing tile drainage ditch, 6 to 24-in. tile.....	C. R. Louthan, Co. Aud.
N. J.	Camden.....8 p.m., June	19..	Constr. sewers in several sts.; two 5-yd. ash wagons....	A. B. Sparks, Chairman St. & Highway Committee.
Ariz.	Tucson.....5 p.m., June	26..	Constructing 30-in. outfall sewer.....	City Engineer.
<b>WATER SUPPLY.</b>				
N. D.	Grand Forks...5 p.m., June	5..	Constructing water mains.....	W. H. Alexander, City Aud.
<b>MISCELLANEOUS.</b>				
N. Y.	Schenectady...2:30 p.m., June	7..	Additions and alterations to garbage reduction plant...	Bd. of Contract & Supply.
Mass.	Revere.....noon, June	15..	Concrete paving mixer.....	C. G. Richmond, Supt. Public Works.

# For Permanency in Concrete Roads and Pavements



KAHN ARMOR PLATE

## Kahn Armor Plates

Kahn Beveled Edge Armor Plates eliminate the possibility of the pavement chipping or cracking at the expansion joint.

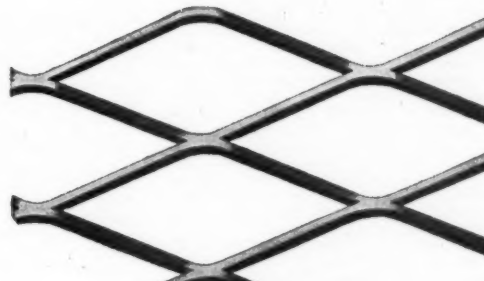
The beveled edge (an exclusive feature) does away with the square corner of the concrete next to the plate, and this with the split-end prongs provides a solid anchorage that no jarring nor traffic can loosen.

## Installing Device

Kahn Improved Installing Device insures the correct placing of the Armor Plates in every installation. Simple in operation and saves greatly in time and labor.

It can be adjusted to any crown and when once set can be used for all plates on the job without further adjustment.

With Kahn Installing Device, the space between the Bars and the Armor Plate permits the finishing of the concrete surface flush with the top of the Armor Plate. A very important feature.



KAHN ROAD MESH

## Kahn Road Mesh

Kahn Road mesh is a strong, rigid reinforcing manufactured from one-piece metal plates. It is shipped in large flat sheets that, when once placed, cannot be jarred from position.

It eliminates the unrolling of coils, cutting to length and tying in position.

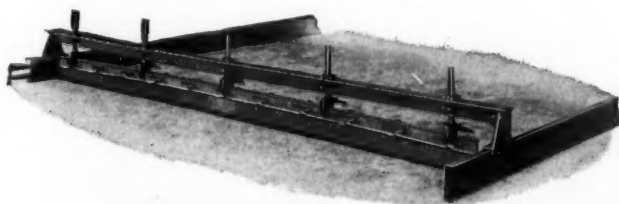
Kahn Mesh will fulfill all specifications and help materially to make your concrete road a better one.

## Kahn Curb Bars

Kahn Curb Bars provide a positive protection against the chipping or cracking of the curb along the edges. The concrete curb is protected with a steel edge which positively resists wear and abrasion.

The Kahn Curb Bar is made from one solid piece of steel. It has deep anchorage that in itself provides a reinforcement to the curb proper as well as a steel protection to the edge.

Send for big, new Road Book. It's free.



KAHN INSTALLING DEVICE



KAHN CURB BAR



## Trussed Concrete Steel Company

Dept. A-66.

YOUNGSTOWN, OHIO

Representatives in Principal Cities





## STREETS AND ROADS

**Birmingham, Ala.**—Bids will be received until June 5 for \$15,000 road improvement bonds of Conecuh County, Ala.; 30-year bonds of the denomination of \$1,000, bearing 6 per cent interest, payable semi-annually at Hanover National Bank, New York City. Address F. J. Dean, Judge of Probate, Evergreen, Ala.

**Phoenix, Ariz.**—Ordinance has been approved for improvement of Second Ave. by grading and curbing.

**Texarkana, Ark.**—Council has been petitioned for permission to create subdivision improvement district for laying of concrete curbs, gutters and sidewalks. City Engineer will investigate and report back to Council at next meeting.

**Los Angeles, Cal.**—Proposed submission of an additional bond issue for extension of interior roads and building of a coast road in Orange county has received endorsement of Associated Chambers of Commerce of Orange county, which organization comprises 22 bodies from different communities.

**Los Angeles, Cal.**—Highway Commission of Riverside County has filed with Board of Supervisors report showing road extensions necessary to complete highway system of that county.

**Santa Ana, Cal.**—Movement is on foot for paving East Third St.

**Santa Ana, Cal.**—City Trustees will be petitioned to pave Fairview Ave. from Main St. to city limits on Bristol St. It is proposed to provide street with curbs 14 ins. high, and gutters so built that in time of storms they will carry away waters that flow to that street from Main, Sycamore, Broadway and Birch Sts.

**Fort Wayne, Ind.**—Plans have been ordered for paving alley between Jefferson and Madison Sts. from Hanna St. to Division St., and for construction of sewer in alley between Bowser Ave. and Holton Ave.

**Fort Wayne, Ind.**—Board considering resolutions authorizing improvement of several streets by paving.

**Indianapolis, Ind.**—Resolutions adopted by Board of Public Works for permanent improvements of several streets, and resolutions providing for other improvements confirmed. Resolution adopted for permanent improvement of Randolph St. from Washington St. to Michigan St., estimated to cost \$19,509. Resolution adopted for paving Kealing Ave. from New York St. to Michigan St., estimated cost being \$9,610. Board adopted resolution for paving Pleasant St. from Shelby St. to State Ave., estimate being \$23,550.

**Penn., Ind.**—City Engineer has been ordered to get estimates for cement curbs and gutters on Miami St. from Main St. to Canal St. City Engineer Horan submitted plans and specifications for combined cement curbs and gutters on Smith St. from Sixth to Second Sts., which were adopted.

**Shelbyville, Ind.**—Petition will be presented to council asking for concrete paving on Mechanic St.

**South Bend, Ind.**—Eddy St. and Mishawaka Ave. will be paved with sheet asphalt, according to preliminary awards made by Board of Works. Final awards will be made June 5.

**Barbourville, Ky.**—Business men of this city are raising fund for repairing highway from this city to Corbin on north, and Bell county line on south.

**Hopkinsville, Ky.**—Christian County's \$400,000 issue of good roads bonds was sold by Fiscal Court to J. C. Mayer & Co. and Rudolph Kleybolte Co., of Cincinnati, on their bid of \$4,120.50 premium and accrued interest to date of delivery.

**Lexington, Ky.**—Twenty miles of improved roadway on leading thoroughfares out of Lexington will be built this year with bond issue of \$300,000 recently voted, and bids will be called for shortly. Roads to be improved immediately are: Maysville, Georgetown, Versailles and Richmond, 5 miles each from city limits.

**Springfield, Mass.**—Board of Aldermen has voted to petition county commissioners to communicate with Boston & Albany and Hampden Railroads with view to setting hearings and taking other necessary steps for laying out new street from easterly end of Page Blvd. in East Springfield to Berkshire Ave., near Seneca St. this requiring the construction of bridges across both roads. Board estimates expense at \$53,575.

**Springfield, Mass.**—The State Highway Commission has appropriated \$10,000 to

be used in town of Agawam for the resurfacing of Meadow St. This sum is thus made available in addition to \$8,000 voted by the town in special meeting held recently.

**Elwell, Mich.**—Sale of \$598,000 worth of Elwell bonds for street improvements has been authorized by ways and means committee of City Council.

**Sault Ste. Marie, Mich.**—Easterday Ave. will be laid with reinforced concrete paving to a width of 40 ft. and a depth of 7 ins.

**Kansas City, Mo.**—Ordinance has been passed providing for widening of Twenty-third St. to a width of 100 ft.

**Kansas City, Mo.**—R. L. McAlpine, Wyandotte County engineer, reported to Board of Commissioners that it would cost \$10,000 to put Kaw Valley Rd. into good condition from Kansas side city limits to end of rock surface beyond Bonner Springs. County commissioners instructed road overseer to do the work. Portable rock crusher was ordered purchased for \$900 to help in the work.

**Kansas City, Mo.**—County Court has referred to Edward M. Stayton, county highway engineer, petition of property owners asking for macadamizing of Golf Ave., Minton St., Overton Ave. and Independence Ave., lying between Van Horn Rd. and Independence Rd., about eight-tenths of a mile.

**Atlantic City, N. J.**—Construction of 18-ft. macadam or stone road from Camden to Atlantic City is contemplated.

**Bayonne, N. J.**—W. T. Crichtfield, who has contract for improving 17 of the 18 streets in Bayonne now undergoing improvement and reimprovement was directed by City Commissioners to pave around Soldiers' Monument at Boulevard, Avenue B and Thirty-sixth St., while resurfacing the latter street. This will bring asphalt paving of Avenue B and Thirty-sixth St. right up to Boulevard line. Crichtfield was also directed to substitute concrete base for the present brick gutter in Thirty-sixth St.

**Fair Haven, N. J.**—Sixteen bids have been submitted to council for laying 60-250 sq. ft. of 4-in. concrete sidewalk, 16-260 lin. ft. concrete curbing and 390 ft. of curb bar. Lowest bid was \$10,843 and the highest about \$15,100. Contract will be awarded shortly.

**Adams, N. Y.**—Village will vote June 5 on proposition to raise \$20,000 for building stone macadam road upon Church, South Park, North Park and Spring Sts.

**Buffalo, N. Y.**—Resolutions providing for bond issue of \$103,000 for pavement and repavement of streets; ordering work of repaving Jefferson St. from Swan to Best St., and authorizing an addition to school No. 17 on Main St. have been adopted.

**Dunkirk, N. Y.**—Board has voted to improve 8-mile stretch of Lake Rd. from this city to village of Silver Creek with slag construction at cost not to exceed \$1,250 per mile.

**Ithaca, N. Y.**—Tompkins County will get approximately \$130,000, which will be used for constructing about 13 miles of additional state roads.

**Little Falls, N. Y.**—Prospect St. will be paved with Tarvia shortly.

## SEWERAGE

**Fort Wayne, Ind.**—See "Streets and Roads."

**Peru, Ind.**—Council has adopted plans presented by City Engineer Horan for lateral sewers between Ninth and Tenth Sts., and on Euclid Ave.

**Peru, Ind.**—Petition for lateral sewer in alley between Second and Third Sts. has been granted and city engineer instructed to draw plans and specifications for same.

**Westfield, N. J.**—No proposals received for sewer construction. Bids will be re-advertised.

**Binghamton, N. Y.**—Ordinance has been adopted for construction of sewer on Walnut St.

**Ironton, O.**—Engineer Howell reported recommending that sewer be constructed out Pleasant St. from Sugar Alley and south on Sixth St. to Ashtabula St., at an estimated cost of \$2,692.20. Report referred to ordinance committee to report back legislation.

**Salt Lake City, Utah.**—City recorder authorized to advertise notice of intention to lay sewer on 11th and 12th East between Michigan and Yale Aves.

**Spokane, Wash.**—See "Streets and Roads."

**Superior, Wis.**—City Commission has

passed resolutions providing for issuance of bonds to pay special assessments for construction of sewers in various parts of city.

## BIDS RECEIVED AND CONTRACTS AWARDED.

(\*Indicates contract awarded).

**Hudson, N. Y.**—For constructing 570 ft. 12-in. vitrified tile sewer: Samuel J. Law, 12-in. bands at \$2, 12x6-in. Ys at \$3.15, tile laid at \$1.25, total \$930.10; Patterson & Malone at \$1, \$2.85 and 90 cts., respectively, total \$734.90. Extra for manholes, \$40. Henry M. James is City Clerk.

**Syracuse, N. Y.**—Bids were received by the board of contract and supply for sewer for Burnet Park Zoo. Lowest proposal was \$787.50 by D. G. Bartolo. Other bids were: Eagle Paving Co., \$1,143.32; Mondo Construction Co., \$913.45; Samuel Bobb, \$882.78; A. Spasato, \$812.50.

**Salt Lake City, Utah.**—Ryberg Bros. for reinforced concrete covered sewer at \$8,837.87.

**Salt Lake City, Utah.**—For construction of sewers as follows: Sewer Extension No. 363, \*Zerbe & Walker, using vitrified pipe, at \$1,194.45; Sewer Extension No. 341, \*Zerbe & Walker, using vitrified pipe, at \$1,295.66; 9th South storm sewer, \*Ryberg Bros., for 4x5-ft. monolithic reinforced concrete section at \$8,837.87.

**Milwaukee, Wis.**—For concrete and terra cotta pipe sewers as follows: John F. Casey Co., Pittsburgh, Pa., at \$470, 441.89; Jas. Ferry & Sons, Baltimore, Md., at \$482,055; F. H. Nakelski, Milwaukee, Wis., at \$530,443; Jas. Kennedy, Fargo, N. D., at \$548,687.80. J. H. Fowles, Secy. Sewerage Commn.

## WATER SUPPLY

**Denver, Colo.**—Issue of \$45,000 municipal bonds for construction of water plant by town of Castle Rock, which was obtained by Guardian Trust Co. of Denver recently, will be disposed of by purchasers on a 5 per cent. basis.

**Laporte, Ind.**—Within the next few weeks contract will be let by city for building in south end of Lily Lake of immense water works reservoir. New reservoir will be 150 ft. in diameter and 24 ft. deep with capacity of 3,180,000 gallons. Its walls will be 18 ins. thick at the bottom and 15 in. at the center portion and 12 ins. thick at the top. Three 10-in. wells will be bored to furnish supply of water for emergency.

**Herkimer, N. Y.**—Special village election will be held some time in July, it is expected, when proposition to raise by bonds about \$250,000 for construction of proposed new water system will be submitted to taxpayers of village.

**Newport, R. I.**—Voted to extend water main on Maple St. for distance of 1,000 feet.

## BIDS RECEIVED AND CONTRACTS AWARDED.

(\*Indicates contract awarded).

**Rector, Ark.**—By Commissioners Water Works Improvement Dist. No. 1, for constructing water works and sewers: \*Long & Hagerty, Bessemer, Ala., at \$54,000.

**Rock Island, Ill.**—For laying water mains in 29th Ave. and 39th St.: \*P. V. Trenkenachuk, Rock Island, at \$16,787, for 6,570 ft. 10-in. pipe, 22 hydrants, etc. W. Treichler is Engineer, Rock Island.

**Commerce, Okla.**—For constructing distributing system, to include cast-iron water mains, pumping station and reinforced concrete reservoir: \*W. S. Sherman Machine & Iron Works, Oklahoma, Okla., at \$17,849; for furnishing and erecting complete air lift equipment, duplex power pumps, motors, piping and all electric equipment, \*Worthington Pump & Machinery Corporation, Kansas City, Mo., at \$6,235; fire hydrants and valves, \*Ludlow Valve Mfg. Co., at \$1,164, and for furnishing and erecting a 75,000-gal. elevated tank and tower, \*Chicago Bridge & Iron Works, Chicago, Ill., at \$5,700; Benham Engineering Co. are engineers, Oklahoma City.

**Memphis, Tenn.**—For reservoirs in connection with North Memphis Levee Project as follows: No. 2 and 3, \*Koehler Bros., \*Fowler Constr. Co., \$28,371 and \$25,633, respectively, and reservoir No. 4, \*A. De Franceschi at \$11,547, contractors of Memphis, Tenn.

## FOR SALE

One Austin-Western jaw crusher; and one Blake pump, 2½ million gallons capacity per day.

Both in good condition.

## BOARD OF PUBLIC WORKS La Crosse, Wis.

Bids received until June 27, 1916

### STREET PAVING

Jackson, Tenn., May 29, 1916.

Sealed proposals will be received by the undersigned until 10 o'clock A. M., on June 27, 1916, for constructing paving on Highland Avenue, Royal and Poplar Streets in this city, approximating 54,000 square yards in measurement, together with grading, concrete curb and gutter, and storm sewers, etc., where required.

Proposals will be on a wearing surface of paving brick with concrete base and sand-cement mortar bed; all in accordance with plans, profiles, and specifications prepared and on file in the office of the City Commissioners.

Each bid must be accompanied by a certified check, made payable to the City Recorder for not less than ten per cent. (10%) of the price bid.

The City of Jackson reserves the right to reject any and all bids.

Specifications can be had and additional information gotten at the office of the City Commissioners, Jackson, Tennessee.

HU. M. HARRIS, Commissioner of Streets.

### TO PAVING CONTRACTORS

Sealed proposals for grading, curbing and paving the below named streets, will be received by the undersigned at his office in the City Hall until 11:00 o'clock a. m., June 5, 1916:

West Hudson Street from west line of South Main to the west line of South Walnut; Fulton Street from the south line of W. Hudson to the north line of West Henry; South Walnut from the north line of West Hudson to Bridge—9,735 sq. yds.

John Street from east line Madison Ave. to east line of Judson—7,348 sq. yds.

High Street from north line East Water to south line East Church—3,780 sq. yds.

Walnut Street from south line West 2nd to south line West Clinton—3,820 sq. yds.

Carroll Street from east line Baldwin to west line Lake—1,260 sq. yds.

Plans and specifications are on file in the City Engineer's Office, City Hall, where also may be obtained the "proposal blanks" which must be used.

Separate certified checks are required as follows:

West Hudson Street .....	\$2,800
John Street .....	2,200
High Street .....	1,150
Walnut Street .....	1,100
Carroll Street .....	370

payable to the order of the Mayor of Elmira, N. Y., and must accompany the bids. They will be returned to the bidders upon execution of the contracts.

The Board of Public Works reserves the right to reject any or all bids.

LOUIS C. ANDREWS,  
City Clerk.

## PUBLIC WORKS CONTRACTORS

### CORBIN, H. K., CO., Inc.

Water Works Contractors

30 Church St., New York City

### FRITZ, W. G., CO., Inc.

Water Works Contractors

ESSEX BUILDING NEWARK, N. J.

### FUSCO CONSTRUCTION CO.

Consulting Contractors

Sewerage and Sewage  
Disposal Plants

James F. Fusco, M.Am.Soc.Eng.Contrs.

665 Broad Street Newark, N. J.

### RENNELL CONSTRUCTION COMPANY Incorporated

Engineering Contractors—Bridges—Water  
Works—Sewage Disposal Plants

PRODUCE EXCHANGE BUILDING  
NEW YORK CITY

## STREET IMPROVEMENT

### City of Johnson City, Tennessee, Legal Notice.

Sealed proposals will be received at the office of the undersigned in the City of Johnson City, Tennessee, until 7:30 p. m., Tuesday, June 6, 1916, for constructing street paving with asphalt, asphaltic concrete, cement concrete or tarvia for Improvement Districts, Nos. 20, 21 and 23, according to plans and specifications in the office of the City Engineer. The city reserves the right to accept bids for separate districts, and to award paving, curb and gutter or sewers separately for each district.

#### Approximate Quantities

13,662 yds. paving, including grading.  
11,226 lin. ft. curb and gutter.  
3,850 lin. ft. 6-in. sewer connections.  
1,500 ft. 8-in. vitrified sewer.  
1,100 lin. ft. 12-in. vitrified sewer.  
9 manholes.

Each bid must be accompanied by a certified check equal to ten per cent. of the amount of the bid as a guarantee of good faith of the bidder.

Bids asked for, are payable in 5½ per cent. bonds.

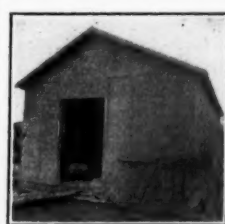
The right is reserved to reject any or all bids. Bids will be opened at a regular meeting of the Board of Mayor and Aldermen, Tuesday, June 6th, 1916, at 7:30 p. m.

P. F. McDONALD,  
City Engineer.

WM. R. POUDER, City Recorder.

### FOR SALE AT BARGAIN

One No. 0 Austin Trench Machine. Boom to dig 15 ft.; 18 and 24 inch buckets. Gasoline power. Used only 3 months. Inquire, Mathias Stipp, 435 Moir Court, Scranton, Pa.



**'Prudential'**  
PORTABLE  
GALVANIZED  
STEEL  
BUILDINGS

ALL SIZES  
FOR  
ALL PURPOSES

CEMENT STORAGE, BUNK and  
TOOL HOUSES, Etc.  
ASK FOR CATALOG "D"

C. D. PRUDEN CO., Baltimore, Md.

### BIDS WANTED FOR ONE (1) MOTOR-PRO- PELLED COMBINATION CHEMICAL EN- GINE AND HOSE CAR.

Sealed bids or proposals for one (1) motor-propelled combination chemical engine and hose car—6 cylinder, 80 h. p. rated by S. A. E.—together with specifications and guarantee, are hereby invited by the city council of the city of Butte, Montana, to be filed with the city clerk at or prior to 7:30 p. m., June 21, 1916. Said proposals or bids will be opened at a regular meeting at the city council chamber.

The bids must be accompanied by a certified check payable to the city of Butte, or cash, in a sum of not less than five (5) per cent. of the amount of bid, to be considered as liquidated damages if the requirements in the way of contract and bond are not entered into within five (5) days after the award has been made.

The city council reserves the right to reject any and all bids.

A. A. DOCKSTADER, City Clerk.

Dated at Butte, Montana, May 26, 1916.

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JOURNAL**

80 UNION SQUARE NEW YORK



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offers

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The volume will comprise approximately 350 pages, bound in stout library edition, 8½ x 11 inches, copiously illustrated with full-page half-tones and line drawings. It will describe concisely but in ample detail, with a wealth of cost data, all the various features of constructing Los Angeles' great municipal power and water works enterprise, costing \$30,000,000. 233 miles in length, built by day labor under city engineers, within the time and financial estimates.

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Those desiring copies should order *immediately*, making checks payable to

Los Angeles Department of  
Public Service

645 South Olive Street,  
Los Angeles, California

## HIGHWAY WORK

OFFICE OF THE STATE COMMISSION OF  
HIGHWAYS.  
Albany, N. Y.

Sealed proposals will be received by the undersigned at their office, No. 55 Lancaster Street, Albany, N. Y., at 1 o'clock P. M., on Monday, the 5th day of June, 1916, for the construction of highways in the following counties:

Dutchess (two highways—6.18 and 6.81); Erie (two highways—0.28 and 2.10); Greene (two highways—3.98 and 6.02); Monroe (approx. 1.72); Oneida (two highways—4.87 and 8.26); Schoharie (approx. 4.43); Schuyler (approx. 0.99); Steuben (two highways—5.21 and 5.58); Sullivan (approx. 8.51); Ulster (one highway—approx. 1.86 and bridge abutments for the Kingston-Port Ewan Bridge); Wyoming (approx. 4.73); Yates (approx. 9.63).

Also for the repair of the following:

Albany (one contract—resurfacing—one highway); Chautauque (one contract—resurfacing—one highway); Delaware (one contract—surface treatment—one highway); Dutchess (one contract—resurfacing—one highway); Erie (one contract—surface treatment—4 highways); Franklin (one contract—resurfacing—one highway); Jefferson (one contract—resurfacing—one highway); Orange (one contract—resurfacing—two highways); Orleans (one contract—resurfacing—one highway); Rensselaer (one contract—resurfacing—one highway); Rockland (one contract—resurfacing—one highway); Suffolk (two contracts—resurfacing and surface treatments—two highways); Sullivan (one contract—resurfacing—two highways); Tioga (one contract—resurfacing—two highways); Tompkins (one contract—resurfacing—one highway).

Sealed proposals will also be received at 1 o'clock p. m. on Wednesday, the 7th day of June, 1916, for the construction of the following highways:

Allegany (approx. 6.88); Cortland (two highways—2.08 and 2.00); Dutchess (two highways—0.88 and 8.97); Hamilton (approx. 6.74); Herkimer (approx. 5.84); Jefferson (approx. 14.05); Livingston (approx. 3.42); Madison (approx. 6.54); Niagara (approx. 7.79); Orange (three highways—0.11; 9.18; 3.70); Westchester (three highways—4.25; 0.35; 6.63).

Also for the repair of the following:

Clinton (one contract—resurfacing—two highways); Fulton (one contract—surface treatment—one highway); Genesee (one contract—surface treatment—one highway); Hamilton (one contract—surface treatment—3 highways); Monroe (two contracts—resurfacing—three highways); Montgomery (two contracts—resurfacing and surface treatment—two highways); Nassau (one contract—resurfacing—three highways); Oneida (two contracts—surface treatment and resurfacing—three highways); St. Lawrence (two contracts—resurfacing—two highways); Schoharie (one contract—resurfacing—one highway); Schuyler (one contract—resurfacing—one highway); Steuben (two contracts—resurfacing—three highways).

Maps, plans, specifications and estimates may be seen and proposal forms obtained at the office of the Commission in Albany, N. Y., and also at the office of the Division Engineers in whose divisions the roads are to be improved. The addressees of the division engineers and the counties in which they are in charge will be furnished on request.

The especial attention of bidders is called to "GENERAL INFORMATION FOR BIDDERS" in the itemized proposal, specifications and contract agreement.

EDWIN DUFFEY,  
Commissioner.

I. J. MORRIS,  
Secretary.

## WANTED

One 10-ton Macadam and  
one 5-ton Tandem Steam  
Roller. Send lowest cash  
price and description to Car-  
lton & White, Inc., c/o The  
Municipal Journal.

TREASURY DEPARTMENT, Supervising Architect's Office, Washington, D. C., May 20, 1916. —Sealed proposals will be opened in this office at 3 p. m., June 23, 1916, for the construction complete (including mechanical equipment and approaches) of the United States post office at Alliance, Nebr. Drawings and specifications may be obtained from the custodian of site at Alliance, Nebr., or at this office, in the discretion of the Supervising Architect. Jas. A. Wetmore, Acting Supervising Architect.

TREASURY DEPARTMENT, Supervising Architect's Office, Washington, D. C., May 25, 1916. —SEALED PROPOSALS will be opened in this office at 3 p. m., June 20, 1916, for the construction complete of the United States Post Office at Waterloo, N. Y. Drawings and specifications may be obtained from the Custodian of site at Waterloo, N. Y., or at this office, in the discretion of the Supervising Architect. Jas. A. Wetmore, Acting Supervising Architect.

The City of Revere invites proposals for furnishing one Concrete Street Paving Mixer. Proposals will be received at the office of the Superintendent of Public Works up to noon of Thursday, June 15, 1916. Each bidder shall submit specifications covering the machine on which the bid is made. It is the present intention to purchase a gasoline engine driven mixer having a capacity of at least one bag batch of 1-3-6 mixture. The price shall include delivery F. O. B. Revere. Each proposal shall be accompanied by a certified check in the sum of fifty dollars (\$50.00) payable to and to become the property of the City of Revere if the bidder neglects or refuses to execute a contract in compliance with his bid. The right is reserved to reject any or all proposals or accept any proposal deemed to be for the best interest of the city. Carl G. Richmond, Superintendent of Public Works. May 29, 1916.

## NOTICE TO CONTRACTORS

Sharpsville, Pa., May 26th, 1916.

Sealed proposals will be received until 12:00 o'clock noon, Tuesday, June, the 20th, 1916, at the office of William A. Graber, Secretary, Borough of Sharpsville, Pa., for the paving of Mercer Avenue, from Big-Cut Bridge to the south line of Walnut Street, with such materials as Council may select; the engineer's estimate of the work is 6,865 square yards.

Specifications and bidding sheets can be had at the office of the secretary or Borough Engineer.

The Borough Council reserves the right to reject any or all bids.

WILLIAM A. GRABER,  
Secretary Sharpsville Borough.

## TRANSITS AND LEVELS RENTED OR SOLD EASY TERMS

THE ENGINEERING AGENCY, Inc.  
53 West Jackson St. Chicago

## FOR SALE

One gas macadam roller.  
Little used. Low price. Write  
L. P. Jenkins Company, care  
of Municipal Journal.